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# Local Anaesthesia Methods and Results in Abdominal Surgery

BY

PROF. DR. HANS FINSTERER

SURGEON-IN-CHIEF, VIENNA HOSPITAL OF THE BROTHERS OF CHARITY

WITH FORTY-TWO ILLUSTRATIONS

AUTHORIZED ENGLISH VERSION

BY

JOSEPH P. F. BURKE, M.D., Sc.D., LL.D.

OF BUFFALO, N. Y.

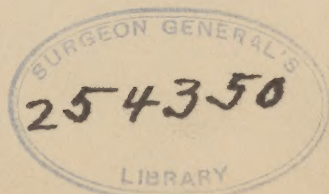
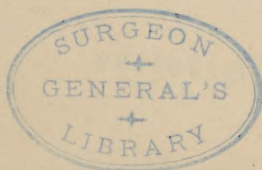
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## FOREWORD BY THE TRANSLATOR

THE marvelous results obtained by Professor Finsterer in his abdominal operations, performed in local anæsthesia, prompted me to make his methods more accessible to the surgeons of America.

The book is essentially a record of his individual efforts and a plea for a careful consideration of the choice of anæsthetic.

I have personally followed the Professor's methods and found that splanchnic anæsthesia is a wonderful help, particularly in gastric resections in elderly patients.

I wish to express my thanks to Dr. Ferdinand G. Möhlau for his assistance in the translation.

JOSEPH BURKE.

*Buffalo, N. Y.*



## PREFACE

A book full of suggestions and new views, a résumé of work of many years by a scientist and untiring laborer in the field of surgery is Finsterer's treatise on Local Anæsthesia Methods and Results in Abdominal Surgery.

Finsterer is one of those who favor a most radical resection for gastric and duodenal ulcer and his statistics are such that they warrant the position he takes. His technique of local anæsthesia, his low mortality and his excellent remote results, lend weight to his opinions.

It is, therefore, expected that his latest views will be read with great interest by the American profession. They should be widely known and critically examined.

I have personally watched Finsterer at quite a number of these operations and under his guidance and assistance have done a few myself in his clinic, and I wish to thank him for this favor. An exhaustive research will introduce his methods into routine practice and recommend them, for after all, no matter how much we claim for our methods of treatment, only those which have stood the test of time, remain until they are replaced by some more valuable.

(Signed) CARL BECK.

*Chicago, Illinois.*



## PROFESSOR FINSTERER'S PREFACE TO THE AMERICAN EDITION

THE great interest which American surgeons have manifested in local anæsthesia, particularly in major abdominal operations, was the incentive to have translated into English my experiences which are collected in book form, thereby to transmit this knowledge to a larger circle of colleagues. Since I personally have not succeeded in mastering the English language I am very grateful to Dr. Joseph P. F. Burke of Buffalo, N. Y., who in a splendid manner has undertaken the translation of my book. Since he assisted at all of my abdominal operations during a long period and thereby learned practically all of the methods, I consider him the most fitted, as my former pupil, to assume the difficult task of the translation; for this I shall always be grateful to him. To Professor Carl Beck of Chicago who also has mastered the technique of local anæsthesia I express my sincere thanks. Under such auspices the success of the American edition is assured.

PROF. HANS FINSTERER.

*Vienna, Austria.*







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# LOCAL ANÆSTHESIA IN ABDOMINAL SURGERY

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## A. GENERAL PART

### I. INTRODUCTION

Asepsis and surgical technic are so complete today that improvement upon them is hardly possible. The results of operations can be brought to a higher degree of perfection by a deeper study and application of the best and the least harmful *methods of anæsthesia*. *General anæsthesia* has become less dangerous than in times past, especially since the introduction of *ether*, so that by a careful consideration of the contraindications, *so-called anæsthesia fatalities* during operation have become *rarities*. It is just as certain that a *protracted anæsthesia* in a major abdominal operation, even when administered by an expert anæsthetist, carries with it an element of *severe systemic intoxication* from which the patient slowly recovers, a fact which naturally can exert a great influence upon the convalescence after the operation. Anyone who has observed, without prejudice, the post-operative course of a stomach resection, whether done under chloroform or a combination of ether and chloroform or even under deep ether narcosis alone, and then compares the course and result of a resection done under novocain



conductive anæsthesia is forced to become *an adherent of conductive anæsthesia*.

While assistant in *v. Hacker's* clinic in Graz, 15 years ago, I was compelled to observe the unparalleled better results of major abdominal operations as compared with those previously observed at the *Hochenegg* clinic. While, at that time, in the clinics in Vienna, all operations were being performed under general anæsthesia, with the *Billroth* mixture, *v. Hacker*, who stood out as one of the pioneers of local anæsthesia, began the laparotomies under local anæsthesia, the *infiltration* of the abdominal walls with *Schleich's* method, as was practiced at that time, exploration of the abdominal cavity and reposition of the viscera under a transitory ethylchloride or ether rausch and the remainder of the operation without general anæsthesia. *The post-operative course was remarkably more favorable, fatalities due to so-called shock, particularly cardiac collapse after operation, were so rare that I soon discontinued the accepted method of deep general narcosis with Billroth mixture as used in the Hochenegg clinic.*

While I used the old *Schleich* infiltration method, even in a few cases the lumbar method of anæsthesia, upon my return to the *Hochenegg* clinic I strove where possible to improve upon those methods of anæsthesia and, instead of the old *Schleich* method, to develop the various forms of *conductive anæsthesia*, an opportunity which the abundant material in the *Hochenegg* clinic offered. By the so often repeated observations of the *unequalled better post-operative course* I became more and more convinced and supported in



my views as to the great possibility for the future of this method of anæsthesia. I have during the past seven years, as chief of the surgical service in the Garrison Hospital II, in Vienna, later in the small service of the Jubilee Hospital of the Franz Josef Ambulatorium and, finally, in the surgical division of the Brothers of Charity Hospital as well as in my private practice, employed almost without exception novocain anæsthesia and found this method alone amply sufficient. As a result of my experience I am convinced that the *method of anæsthesia is of greatest significance in the success of the operation*, and I have proved it and expressed my convictions repeatedly in scientific writings.

There may be various reasons advanced by most of the surgeons today for the employment of *complete general anæsthesia in major abdominal operations*. The view that *general narcosis is absolutely harmless* finds even today many advocates, the principal reason being to shorten the duration of the operation by *very rapid* work. The assertion that it is quite *impossible* to perform *large abdominal operations painlessly without general anæsthesia* has also found supporters, for the reason that it is better to begin the operation at once under general narcosis. This decision can only be arrived at because the rules of local anæsthesia are not followed out in every minute detail. One chief reason why some surgeons refuse to employ local anæsthesia, even when the patients and their relatives expressly demand it, is this, that the *greater delicacy and slower progress* of the operation which in every case of local anæsthesia is absolutely necessary, makes the operation



*last longer*, whereby it becomes impossible to perform daily in the hospital three or four major operations and possibly as many or more in private practice. With the great number of surgeons in Vienna at the present time it is certainly not necessary to state that the commercial side of such an important question is very much of a deciding factor, because we know that when a surgeon operates on all, even the minor cases, it is not in the interest of the patient but principally in the financial interest of the operator himself.

For the practical surgeon in a small country hospital the exclusion of general narcosis has the great advantage that an extra physician, an anæsthetist, *is not necessary*. We must also not forget that it *makes slow and careful operating* a necessity, which is of exceeding value in the perfection and soundness of gastro-intestinal suturing and the final outcome of the operation. The exposed position which the surgeon in a small country place occupies makes it necessary for him to be on his guard against unjust criticism and strive to avoid every possible bad result.

The performance of any major operation without general anæsthesia *demands exact knowledge of the rules of local anæsthesia* which can be acquired only by wide experience. Now we find in the larger monographs of *Braun* and *Härtel* on local anæsthesia such an important subject as local anæsthesia in abdominal operations given but scant notice (in the latter work we must be satisfied with three pages only because *Härtel* still maintains that in major operations general anæsthesia is to be preferred), so that the practicing surgeon can hardly find any guidance at all.



In order to remedy this defect I will communicate in this book my experience, covering more than ten years, and using this as a basis I will outline general instructions for the most rational methods of local anæsthesia in individual cases.

## II. The Development of Local Anæsthesia in Abdominal Surgery

From the historical development of local anæsthesia only such data will be taken which pertains to the performance of abdominal operations and, in order not to make the book unnecessarily voluminous, only the most important will find particular mention.

The endeavor to perform abdominal operations under local anæsthesia dates back more than twenty-five years, even if the results corresponding to the anæsthetics used in those days were naturally very meagre. Twenty-five years ago *v. Hacker* and *v. Mikulicz* were evidently the first to undertake laparotomies (gastrostomy and gastro-enterostomy) under local anæsthesia, soon after the introduction of the *Schleich* infiltration method. According to the opinion held at that time anæsthesia of the abdominal walls was local, but for the surgery of the deeper parts transitory general anæsthesia was resorted to, *v. Hacker* as a rule preferring ethylchloride. This same procedure was continued by *v. Hacker* in his clinic in Graz, where I learned the method while assistant in the clinic in 1907. In the *Mikulicz* clinic the *Schleich* infiltration method not only was used in the gastro-enterostomies but also in the larger gastric resections. It is to be observed in a report from *Gott-*



stein that from 1896-1898 in 12 pylorectomies 9 were done under local anæsthesia, 3 under general narcosis, compared to 43 gastro-enterostomies in which 9 were under local and 34 under general anæsthesia. It strikes us as peculiar *that the number of resections under local anæsthesia is relatively greater than the number of gastro-enterostomies*. An explanation for this is found in the communication of *Gottstein*, namely, that the local anæsthesia was employed in resections in under-nourished, weak patients because it seemed hardly safe to attempt surgical interference in cases of such magnitude under general anæsthesia. Concerning the technique of the anæsthesia employed we find no definite mention, yet it appears that the infiltration was used in the line of incision only, while for the work on the abdominal viscera sensibility was reduced by the previous hypodermic administration of morphin. In spite of the enormous advantages offered by local anæsthesia even at that time its use was later again abandoned because it seemed to be proven that in patients operated on under *local anæsthesia pulmonary complications* were relatively *more frequent* than in patients under general narcosis. The saying which is repeatedly mentioned in the literature that under local anæsthesia the harmful *lung complications cannot be avoided* is attributed to *Gottstein*. We will return later to this very important point in detail.

According to a report of *Rütger* general anæsthesia was not regularly used in gastro-enterostomies in the *Leidener* clinic in Holland. A convinced disciple of local anæsthesia in abdominal operations is *Lennander*, who, by reason of his studies on painful sensations



in the abdomen, with due consideration of the technique used in 1911, expressed his conviction *that a combination of local and general anæsthesia* would be the *method of the future* in those cases in which general narcosis alone is feared since the amount of ether used is comparatively small. *Backes* operated all his laparotomies under *combined anæsthesia* according to the dictum of *Lennander*, i.e., the abdominal wall opened under *Schleich's* method and the orientiering and proper placement of the viscera for gastro-enterostomy, under transitory ether narcosis, then followed another ether-rausch for the correct replacement of the organs and the abdomen was sutured under new infiltration of the abdominal wall. Inasmuch as transitory *ether* intoxication was used in ALL of these cases we may justly call this method "*combined anæsthesia.*"

*Bier*, as early as 1909, mentioned the necessity of local anæsthesia especially in abdominal operations. He recommended besides the infiltration of the abdominal walls with novocain and previous administration of morphin subcutaneously,  $1/6$  of a grain *one hour* before and  $1/6$  *immediately* before the operation. In this manner the patients experience no pain and no vomiting when the stomach and bowel are drawn upon. The cutting through of the mesentery and the tying of the vessels remain painful. An injection of novocain into the mesentery was not yet made at that time.

*Lärwen* recommended the *combined anæsthesia* in this manner, that first the local anæsthesia of the belly wall be made, followed by the general anæsthetic, and then the operation begun. The general narcosis then



is at times made more profound, at times lessened. The suturing of the abdominal incision is done under pure local anæsthesia. In this manner a much *smaller quantity of general anæsthetic* is used and the danger of aspiration materially lessened and the irritation of the anæsthetic upon the bronchial mucous membrane ameliorated. *Lärwen* recommends therefore *local anæsthesia of the walls* in order to *lessen the amount of anæsthesia in all laparotomies*.

Since up to the year 1912 the abdominal walls were infiltrated while *the mesentery and its vessels and nerves were ignored*, it is clear that every pull on the organ or the ligating of the mesentery necessarily caused pain and one was obliged to resort to ether as a useful aid. In gastro-enterostomies only was it possible with the aid of morphin to operate without ether, provided, searching and placement of the organs presented no particular difficulties.

In order to overcome the pain caused by traction upon the mesentery when it is cut through I began 12 years ago to *anæsthetize the mesentery*, and in an article regarding local anæsthesia in gastric operations (which appeared 10 years ago in *Beiträge z. clin. Chir.* Bd. 81) I recommended interruption of the *conducting nerves in the mesentery at their base, always by novocain injection*. In this manner it became possible to perform extensive gastric resections without pain. This infiltration anæsthesia was again recommended by *Drüner* 9 years later and given preference over *Braun's* splanchnic anæsthesia. It was only by the introduction of anæsthesia of the mesentery that a painless resection was made pos-



sible; although improvements in the technique of anaesthesia were still possible.

It is today a well accepted fact that the *peritoneum of the anterior abdominal wall is most sensitive to pain*, the peritoneum of the posterior wall is also sensitive, for when a severe tug is made on adherent mesentery pain is caused. Accurate *post mortem* examinations have convinced me that this *pain conduction* is through the *rami communicantes* which enter forward and unite themselves in the dorsal segment in the splanchnics (major and minor), in the lumbar segment in the inferior mesenteric ganglion which go to supply the pelvic organs, the bladder, the genitals and colon. In order to *desensitize the peritoneum of the posterior belly wall* I recommended as early as 1912 the so-called *paravertebral conductive anaesthesia* in certain abdominal operations, after the same had been employed by *Lärwen* in kidney operations, while in this same year *Kappis* published an article concerning its use in abdominal operations. Although in literature *Sellheim* is regarded as the father of paravertebral conductive anaesthesia (*Braun*), in our way of thinking it is not correct. For *Sellheim* at that time was of the opinion of *Lennander* that only the parietal peritoneum of the anterior abdominal wall is pain conductive, that therefore the *sensibility* must be excluded. The importance of the *rami communicantes* for the conduction of sensible fibres from the mesentery of the organ to the spinal column was not known to *Sellheim*. Therefore *Sellheim* endeavored to obtain an exclusion of the intercostal nerves that supplied the abdominal



walls as well as the ileohypogastric and ileoinguinal nerves. Inasmuch as he undertook the interruption of the intercostal nerves at the jugulæ costæ 8 cm. from the spinal column, the rami communicantes cannot by this method be reached. In the ileohypogastric nerve *Sellheim* for an easier orientation keeps close to the neighborhood of the spinal column. That in this manner no *paravertebral* anæsthesia in the present day idea was reached, is evident from the fact that only the cutting through of the anterior belly wall was painless, while simple traction on the round ligaments or on the tube caused pain. The experiments reported by *Sellheim* which remained buried for a long time in the transactions of the gynecologists, are not therefore to be considered as paravertebral anæsthesia for the exclusion of the sensitiveness of the mesenteries and the peritoneum of the posterior belly wall. The *introduction of paravertebral conductive anæsthesia signifies the further progress of anæsthesia of the abdominal cavity*. In spite of its disadvantages and unpleasantnesses this method soon found adherents. In 1914 *Jurasz* reported two cases operated on by *Payr* with perfect success, a cholecystectomy and a choledochotomy, in which paravertebral conductive anæsthesia of the right side, only from the 6th dorsal to the 1st lumbar segments, was accomplished.

In the clinic *Dollinger*, in Budapesth, almost all of the laparotomies were performed under local anæsthesia of the belly walls and injection of the lesser omentum, as advocated by me in 1912. Later, paravertebral anæsthesia became the method of choice



almost exclusively by *Adam*, using a 1% solution, in which both sides were injected from the sixth dorsal to the third lumbar segment. The clinic *Dollinger* and its chief certainly rendered a great service when by systematic use the proof could be brought that it is possible to perform even major abdominal operations 84% (*Holzwarth*) under novocain anæsthesia alone. The clinic *Hochenegg*, where *Dr. Görgö*, 1912, the assistant in the Clinic *Dollinger* had first learned from me, 2 years before, the advantages of the local and paravertebral anæsthesias, soon became superior in the performance of these operations. It is not surprising therefore that because during the whole course of the war efforts were made to perform nearly all the laparotomies under local anæsthesia, the method soon became known and taught as *Dollinger's method*.

While paravertebral anæsthesia, on account of unpleasantness to the patient and its dangers, could not find the desired recognition amongst the surgeons, it found more advocates amongst the gynecologists. Thus *Siegel* in the Freiburg clinic for women, *Schmid* in the Prag clinic and *Frigyesi* in Budapesth, advised the extensive use of paravertebral anæsthesia, which naturally must be combined with parasacral anæsthesia in operations on the pelvic organs. *Siegel*, in 1917, had reported over 1300 paravertebral anæsthesias, 90.7% of which were complete.

As a continuation of paravertebral anæsthesia on the pelvic organs *Braun*, in 1913, added the *parasacral* or, better, *præsacral* anæsthesia, by which laparotomies could be successfully performed on the organs



in the lesser pelvic cavity. One year later *Tölken*, an assistant of *Braun*, was able to report 43 cases of parasacral anæsthesia.

In operations for appendicitis *deep anæsthesia of the iliac fossa* was advocated by *Fowelin* and *myself*. It is rather simple and in the majority of cases, even where extensive adhesions are present, is sufficient.

Inasmuch as 12 to 18 needle punctures are necessary in paravertebral anæsthesia for a gastric resection, which in the orientation of the transverse processes with the needle cause pain, and furthermore relatively large amounts of the novocain are brought into close proximity with the dura, it became very desirable to simplify this method. The fact that the rami communicantes of the 6-12th dorsal nerves unite to form the *major and minor splanchnics* and reach the celiac ganglion, made me think of the possibility of interrupting the main trunk at once instead of the individual rami. This occurs in *splanchnic anæsthesia* which was first mentioned by *Kappis* in 1918. Of course this was another step in advance in our technique of anæsthesia. The method was soon tried out and *Denk* from the clinic *Eiselsberg* reported good results, so that he designated it as the method of choice in cases of bowel obstruction, particularly on account of the simultaneous relaxation of the abdominal walls. Accidents that happened in splanchnic anæsthesia either due to faulty technic (intravenous or intradural injection), or caused by too large doses of novocain, and also the reports of fatal cases occurring after this method made it essential to try to improve upon it. In the technique advanced by



*Braun* of the blocking of the *splanchnics* from in front after first opening the abdomen we possess a method which almost always causes complete analgesia if the strict technical rules are observed and the correct quantities of novocain are used commensurate with the general condition of the patient, which are considered *safe*. According to my own personal experience the *splanchnic* anæsthesia of *Braun* marks a decided step forward, so that I cannot therefore support *Drüner* in his repeatedly expressed opposition to this method. The method of *Wendling* to inject the *splanchnics* blindly through the unopened belly through the liver found no advocates.

Recently *Schuster* in the *Heidenhain* clinic in Worms wrote a paper on *high sacral anæsthesia*. He reported not only operations on the pelvic organs but also stomach and gall bladder operations in which to avoid respiratory disturbances intramuscular injections of *hypophysin* were given. The method of sacral anæsthesia first introduced by *Lärwen* found thereby a considerably wider field of usefulness. The complete relaxation of the abdominal walls which occurs is indeed an advantage, and can be of particular importance in the abdomino-sacral extirpation of a deep seated carcinoma of the flexure. For operations on the stomach and gall bladder, other methods, especially *splanchnic* anæsthesia, are at our disposal which have not only fewer failures than the high sacral anæsthesia (in 45 stomach operations, gastro-enterostomies and resections, 9 imperfect anæsthesias, 6 complete failures), but is also less dangerous than the high epidural anæsthesia of which *Heidenhain*



amongst 638 operations had recorded but 2 deaths that occurred immediately after the injection.

Within the past year a *new* method of anæsthesia was suggested by *Seidel* and *Baruch*. In order to block the nerve endings in the abdominal cavity large quantities (up to 600 cm.) 1/2 of 1% novocain solution are directly injected through the abdominal wall into the free abdominal cavity. *Seidel* tried this method in 48 cases and obtained complete anæsthesia of the abdominal cavity 31 times. The necessary amount of novocain in some cases reached 6 gms. This method should be relatively simple, it remains only necessary to make sure clinically whether the anæsthesia suffices to *ligate the mesentery*, although the larger nerve trunks are not excluded, further whether severe general manifestations or *deaths from poison* are not frequent occurrences.

Foreign literature contains very little concerning local anæsthesia, especially its employment in abdominal operations. In fact local anæsthesia is as yet little used judging from personal communications from other doctors. It is not surprising therefore that reports of individual operations, e.g., a gastric resection by *Irwin*, an entero-enterostomy in a case of vicious circle by *Graham* are mentioned. In America where in Gynecology (*Bartlett, Cole, Webster*) it has gained in favor, it apparently has found little use in abdominal surgery. Nevertheless in that country it was considered a step in advance when a surgeon reported several cases of appendicitis which he had operated on under local anæsthesia. *Wiener* reported 15 cases of appendicitis operated on under



local anæsthesia, with an exact description of the anæsthesia which consisted essentially of an infiltration of the tissues in layers, including mesentery. With these few cases as a basis he asserts the significance of the anæsthesia, particularly in acute cases, so that he extended its use to cases of diffuse peritonitis. *Kanavel*, in 1922, reported a case of splenectomy under splanchnic anæsthesia according to a method mentioned by *Labat*, i. e., the *Kappis* splanchnicus anæsthesia from behind.

Convinced adherents of local anæsthesia are *Crile* and *Farr*. Crile excludes the conductivity of the sensory nerves by means of novocain with the view of preventing surgical shock. He always used in addition, ether anæsthesia. The quantity of general anæsthetic used is considerably lessened through local anæsthesia. The most ardent supporter of local anæsthesia seems to be *Farr* who in several articles advocates the importance and more general use of this method. In 1916 he mentioned at a medical meeting in Minneapolis the great importance of local anæsthesia. A comparison between a series of abdominal operations in local anæsthesia with a series in general anæsthesia gave a much *better post-operative convalescence* for the local anæsthesia cases so far as meteorism, nausea and vomiting were concerned, and also as regards the general condition of the patient, so that local anæsthesia is positively preferable. It may be *employed in operations on children*. In a lecture delivered in 1919 he again advocated a more extensive use of local anæsthesia and asserted that local anæsthesia possesses such great ad-



vantages to every surgeon who has had sufficient experience in its employment that the *general narcosis will cease to be the method of choice*. Another great advantage *Farr* sees is that the surgeon must operate with *delicacy and circumspection*, avoid the tearing of tissues which favorably influences the healing of the wound. At present *Farr* begins all his *laparotomies under local anæsthesia*, that is, infiltration of the abdominal walls, and uses general anæsthesia then only when necessary. Small children, even infants, can be operated on under local anæsthesia. For the injections *Farr* makes use of a pneumatic syringe of his own invention giving a steady flow under constant pressure which causes an even diffusion of the solution. In the subsequent discussion *Skillern* agreed with *Farr* and expressed his conviction that the high mortality in *acute intestinal obstruction*, which is due principally to shock, can be lessened by the use of local anæsthesia. *Scott* recommends besides the infiltration of the tissues to be incised, also to infiltrate the subperitoneal tissue on both sides of the incision. In another paper which appeared in 1922 *Farr* speaks of the *Kappis* splanchnic anæsthesia in upper abdominal operations (stomach resection, operations on the bile ducts) with good results. In France general anæsthesia is still the rule in laparotomies; in exceptional cases lumbar, particularly the *high lumbar anæsthesia*, according to *Jonescu* (*Riche*) seems to find favor. *Bloch* avoids the high lumbar method as too dangerous and recommends laparotomies below the umbilicus under deep lumbar anæsthesia instead, whereby 25-30 cc. liquor are rapidly with-



drawn and novocain-adrenalin (0.15) quickly injected. The higher the anæsthesia is to reach, the more liquor must be withdrawn. Elevation of the pelvis is not advised during the procedure.

Lately *splanchnic anæsthesia* has found a few adherents in France. It is not called the *Kappis* method, as in Germany, but the *Nägeli*, although in the work of *Nägeli*, which appeared two years later from the German clinic of *Garre* in Bonn, *Kappis* is quoted. The most frequent use of this method was in the clinic *Pauchet* by his pupil *Labat*. In a monograph which appeared in 1920 *Labat* discusses the advantages of the paravertebral and splanchnic anæsthesias on the basis of 20 cases operated on by *Pauchet*. He designated the *paravertebral as the method of choice in gastric-intestinal surgery* because it can be employed in weak and emaciated subjects giving a sense of security to the operator. Since post-narcotic complications are absent, particularly in the bowels and lungs, the post-operative course is favorably influenced. Therefore paravertebral anæsthesia is especially indicated in cachectic and weak individuals, in old people, in arterio-sclerotics, in existing heart and lung diseases, but *principally in all cases of hemorrhage and perforation of the gastro-intestinal tract*.

In a later work he reported 34 operations under splanchnic anæsthesia, among which were 24 stomach resections with 21 good results. In 34 abdominal operations the anæsthesia was good in 30, medium in two cases, complete failures in two cases. *Perrier* recommends splanchnic anæsthesia of *Kappis* on the basis of his favorable experience in 18 cases.



### III. The Importance of the Anæsthetic for the Result of Abdominal Operations

In major abdominal operations the general anæsthetic has a particular significance on account of the peculiarity of the laparotomy itself. Through its exclusion we not only are able to enlarge materially the *indications* for operation, but also in spite of this extension to *improve greatly the results*.

Since the *contraindications of general anæsthesia* (severe diseases of the heart, lungs, liver, kidneys, progressive cachexia), that were of considerable importance up to now, are naturally eliminated by the complete exclusion of general anæsthesia, we are enabled to operate on many more cases under local anæsthesia with good success, cases which could not be operated on under general anæsthesia and in fact many cases which the surgeons who operate under general anæsthesia refuse to operate. This advantage of local anæsthesia is pronounced in not only abdominal but in all operations. Although I have not refused to operate a single case I find that the results obtained now are better than formerly, a matter that will be discussed more thoroughly in special chapters of this book.

*In emergency operations for the relief of bowel obstruction or peritonitis* the influence of general narcosis in comparison to local anæsthesia must become apparent in the immediate results of the operation. It is a long established clinical fact that not only in protracted cases of intestinal obstruction but also in peritonitis, there occurs a considerable lowering of the blood pressure, because as a result of the



absorbed toxins the vaso-constrictors are badly damaged, as a result of which the blood vessels become dilated. Only the fact that in consequence of the increasing meteorism the *intra-abdominal pressure* rises and exerts itself upon the partially paralyzed intestinal vessels thereby keeping them compressed externally, is considered the cause of so little blood in the abdominal vessels before the abdomen is opened. But if after the laparotomy and the eventration of the intestinal coils the intra-abdominal pressure is reduced suddenly, the paralyzed blood vessels dilate and are filled at once with blood. The result of which is a lessened volume of cardiac action with all of its harmful consequences.

The second fact remains that during every *chloroform* as also during every deep ether narcosis the blood pressure becomes considerably lowered. In regard to *ether* it is believed even today that it does not lower the blood pressure, a view that is not at all correct. The younger *Koenig*, in the last Congress of Surgeons, on the basis of the vast number of careful examinations made in the *Kirscher* clinic in Königsberg, was able to assert that there *exists no essential difference between chloroform and ether anæsthesia*, that the blood pressure sinks in the deep ether narcosis exactly as in chloroform anæsthesia.

When I permit a patient with intestinal obstruction or peritonitis to be *narcotized* so that I can open the peritoneum of the anterior abdominal wall, I continue to lower the blood pressure, which has been reduced by the toxins, still more, because for the opening of the peritoneum a profound anæsthesia is



needed. We all remember the days when we were obliged during our younger years to administer general anæsthetics during laparotomies. If an *eventration* of a part of the intestinal coils becomes necessary to determine the seat of trouble we must expect in the summing up of these existing dangers that it must come to a sudden overlooking of the paralyzed abdominal vessels to which the narcotized patient responds with a *collapse* and a sudden occurring *asphyxia*. For this form of asphyxia occurring during the moment of eventration the anæsthetic is almost always held responsible, but quite unjustly. It finds its logical reason in both the harmful agents; in one the nature of the malady is given, the other is produced by the order of the surgeon to have the patient narcotized. If in such a case *fatal asphyxia* occurs then no blame is attached to the anæsthetist provided he conforms to the rules, but the operator must consider this possibility when he prescribes general anæsthesia. In order to avoid collapse of this nature the rule was observed for a long time that we should entirely avoid *eventration* for ileus and be satisfied with the making of an intestinal fistula in the nearest coil of intestine, which naturally relieves the intestinal obstruction. Naturally only *half of the work* can be accomplished by this procedure and the secondary extensive peritonitis the result of the gangrenous intestinal loop left in the abdomen, is unavoidable.

WE ARE NOW ABLE TO AVOID *with certainty these dangerous collapses* when we

1. exclude the sinking of the blood pressure in general anæsthesia and



2. increase the already *lowered* blood pressure before opening the belly and keep on raising it during eventration.

The first condition is brought about completely by the use of local anæsthesia. For we can safely open the abdomen entirely without pain and without reduction of the blood pressure, because the small quantities of novocain required have no influence upon the blood pressure which is rather elevated by the simultaneous use of adrenalin. The reduced blood pressure due to the *toxic paralysis* of the vessels can be raised again before operation by increasing the quantity of fluid in the vessels by intravenous administration of saline solution to fill the vascular system on the one hand, and on the other by the injection of *adrenalin* which causes a temporary contraction of the blood vessels. Actually we find that a barely perceptible radial pulse becomes more palpable after an adrenalin saline infusion and a certain tension becomes noticeable. When an improvement of the pulse does not take place after this infusion very poor hopes are held out for the patient and the question remains whether in such cases it were better not to operate at all. Yet, personally, I have not been able to so decide. In order to maintain an even blood pressure during and after operation I give intramuscularly an injection of *puitrin* or *pituilanol*, a preparation that has given such excellent service in the treatment of diffuse peritonitis. During the operation we may increase the blood pressure by permitting the patient to inhale small quantities of



ether. This brief ether intoxication can be simultaneously used in abdominal localization but by no means should we permit the intoxication to extend into true ether narcosis. It may be possible under such conditions to operate successfully even in doubtful cases without the making of an intestinal fistula. From the many examples in my experience I will cite briefly two.

Eleven years ago, in the clinic *Hochenegg*, I operated on a young man 25 years old, for a volvulus of the sigmoid flexure. The patient entered the operating room in severest collapse (pulse 160, almost imperceptible, extremities cyanotic and cold, cold sweat). Under local anæsthesia the belly was opened, the enormously distended sigmoid flexure was emptied by puncture (six quarts); only after this it became possible to deliver the enormous flexure out of the abdomen and relieve the existing volvulus. For this procedure a brief ether intoxication was employed. As a result of the increased blood pressure caused thereby there occurred such a marked improvement in the pulse that after the resection of the partially gangrenous flexure the circular suture could be applied, which became necessary because the descending link could not be sutured in the belly wall for a two stage resection. By this circular suture, done in the deep pelvis, the continuity of the intestine was re-established. In spite of the poor general condition the patient made an excellent recovery from the operation.



A seventy-one year old woman suffering from *ulcer duodeni* for many years entered the sanatorium for operation, with a diffuse peritonitis and barely palpable, rather irregular, pulse fifteen hours after perforation of the ulcer. Only after an intravenous saline-adrenalin infusion the pulse became somewhat improved so that a last effort to save the patient with an operation was attempted. The laparotomy was done under local anæsthesia with 1/4% novocain solution, using ether as stimulant by the drop method (during the whole operation 10 ccm. ether), suturing of the perforation, pylorus exclusion, posterior gastro-enterostomy. Lavage of the abdominal cavity with physiological salt solution. Complete smooth recovery; 4 years later patient in good health.

Though I have never refused to operate on any case, no matter how bad the pre-operative condition was, if there was any pulse at all to be felt, I have lost but a single case (a 79 year old woman with *volvulus* and gangrene of almost the entire small bowel) during the operation. Especially in such cases the exclusion of deep general anæsthesia assists in preventing fatal collapse where the necessary eventration can be done to make the diagnosis clear; particularly the exclusion of *chloroform* which, even today, is used in cases to begin the narcosis and carried to a point sufficiently deep for the opening of the peritoneum. In my opinion it is worth while *in all cases of volvulus to avoid deep narcosis entirely and to use instead, an exact local anæsthesia of the abdominal*



*wall.* The so-called protracted ether intoxication without local anæsthesia must become sufficiently deep for the opening of the peritoneum which actually exceeds the intoxication stage where it cannot be decided whether a decidedly dangerous blood pressure reduction may not be brought about.

By the exclusion of deep general narcosis, particularly chloroform or the chloroform-ether mixture, the *post-operative* course after *major operations* is favorably influenced. *Deaths due to so-called surgical shock* which occur within 24 hours, where the autopsy does not show evidences of serious organic disease, especially the heart, do not occur in operations under local anæsthesia. Ten years ago in my examination thesis (Wr. kl. W., 1913) I asserted that *deaths from surgical shock* could only be considered as *cases of prolonged narcosis* and could be avoided by the exclusion of deep general anæsthesia. I am actually able to state that amongst my 2409 laparotomies, including 693 gastric and 163 intestinal resections, though the patients were old and cachectic and all the operations radical, *I have not had one fatality from surgical shock*. It is quite natural to expect a death should occur in those cases where the severest cardiac diseases and most profound anemia following acute hemorrhages exist, cases in which no surgeon would think of operating under general anæsthesia because death may occur in the first 24 hours. These fatalities must be excluded in the criticism of the dangers of the anæsthetic.

It has been proven by recent investigations that *these deaths from surgical shock* (so-called) are



caused by insufficiency of certain organs due to the anæsthetic. *Schur* and *Wiesel* have pointed out that in cases of prolonged narcosis an exhaustion of the chromafin substance in the *adrenals* is produced which finds expression later on by lessened production of adrenalin. The view of the predominating adrenal injury as the cause of the so-called *surgical shock* finds advocates amongst the French authors *Delbet*, *Herrnschmid* and *Beauvy*. These writers were able to reduce considerably surgical shock by the administration of adrenalin before and after operation. Seven years ago *Crile* advanced the theory that during an anæsthetic the quantity of acid found in the blood was increased and this *acid increase* was eventually the cause of death. According to his observations this acid increase is mostly *brought about by ether*. At first it is equalized by the adrenal secretion but serious consequences follow when this ceases. For this reason adrenalin should be given to overcome asphyxia.

The permanent INJURIES TO THE LIVER which can eventually cause death under the picture of *acute yellow atrophy*, are of particular significance. These injurious influences are observed in every chloroform anæsthesia, as also after prolonged ether narcosis, but are transitory where the liver had not lost its resistance through previous disease. That is why deaths from acute yellow atrophy of the liver are so relatively seldom after major operations. The importance of liver changes was underestimated for a long time. Twenty years ago the gynecologist *v. Herff* pointed out that the frequent deaths attributed to



“peritoneal sepsis” of the early days in which no peritonitis at all was demonstrated at autopsy, were due to such chloroform injuries to the liver. Then came *Stierlin*, who, on the basis of his own case and 21 cases taken from the literature, drew attention to the great significance of *acute yellow atrophy of the liver* as the *cause of death* after *narcosis* and explained the same as after-effects of chloroform. Since the appearance of this collected report further observations found their way into literature. *Sprengel* in 1913, at the Congress of Surgeons, pointed out in particular the meaning of these liver injuries and in a very vehement lecture took a stand against the use of chloroform in abdominal operations and expressed the following weighty sentence: “He who employs chloroform, even in small quantities, in diseases of the abdomen, especially in hepatic diseases, is guilty of a scientific error.” In this sentence which implies a serious accusation against many surgeons who still employ chloroform, he goes too far, because we can only speak of scientific mistakes when an acknowledged and generally recognized teaching has been intentionally neglected. Thus it was that no surgeon contradicted it at that time. In the *extended work* we still find the sense of this saying, but the *style* is considerably modified.

Recently there appeared an article by *Balkenhausen* from the *Tilman* clinic, in which he discussed 5 fatal cases of acute *liver* injury after chloroform anæsthesia. The younger *Schnitzler* communicated briefly 6 similar fatal cases in the open convention of Viennese surgeons.



Judging from my personal experience I agree entirely with *Sprengel* that no chloroform *should be used* in laparotomies, especially acute diseases of the abdomen and gall stones, and I go a step farther and assert that even the use of ether, which today is of such poor quality and produces almost the same bad effects as chloroform, *should be reduced to a minimum*. I thus explain my extraordinary favorable results especially in these diseases, a matter which will be more specifically treated in each special chapter.

Besides the toxic influence of narcotics upon the liver cells there is discussed in a French article by *Widal*, *Abramin*, and *Hutinel* the fact that chloroform, even in small doses, ether and laughing gas after prolonged use affect the liver cells very seriously, while novocain does not affect the liver cells at all. These interferences with the liver cells disappear in a few days in those patients whose livers are normal, while they may cause hepatic insufficiency with serious consequences in those suffering from liver disease.

That novocain does not injure the liver structure is explained by the small dosage and its not being absorbed quickly enough into the circulation.

A further complication in the course of *laparotomies* is the occurrence of ACUTE GASTRIC DILATATION. While this has been ascribed to the opening of the abdomen itself, to the traumatic injury and the unavoidable chilling of the viscera, the influence of the narcotics has not been even considered. Exact clinical observations have demonstrated that this dilatation can occur in *other than abdominal operations*, as for



instance, after operations upon the extremities where there can be no question of harm to the abdominal viscera. Fifteen years ago *A. Peyer* mentioned in one of his works *that after every chloroform narcosis dilatation of the stomach was observed extending 3 to 4 finger breadths below the navel, with vomiting, and that this dilatation disappeared after a few days.* During my assistantship in the clinic *v. Hacker* I could observe the same findings on the clinical material so that as far as I was concerned it became a fact that the *principal cause of the dilatation* after laparotomies is not to be found in the traumatic injuries or chilling of the organs, but in *the narcosis*, although the above mentioned injuries are able to increase the harmful effects of the narcosis, the threatening gastric dilatation occurs more frequently in abdominal than in other operations.

In former years it was accepted that these dangerous, sometimes fatal *gastric dilatation*, only happened after chloroform anæsthesia, whereas in spite of protracted ether narcosis it did not occur. An article I published ten years ago agreed with this view. The experience of recent years has shown that severe gastric dilatation may *occur under pure ether narcosis* as may be learned from surgeons who operate exclusively under general anæsthesia.

In those laparotomies performed under exclusive novocain anæsthesia acute *gastric dilatation is a very rare occurrence.* I have been able to observe only three (3) cases of severe gastric dilatation among my own large gastro-intestinal material. But in these instances the chilling of the organs proved to be the



explanation because we were obliged to operate in an operating room which lacked the proper heat, the temperature not exceeding 10° to 12° R. But these cases recovered after a few stomach lavages.

The POST-OPERATIVE VOMITING in which great quantities of green fluid is thrown up, which in many cases is but a sequel of gastric dilatation, has become much less frequent under local anæsthesia. This great advantage is most heartily appreciated by those who themselves had been previously operated on under chloroform anæsthesia and learned to know the terrible feeling of nausea from personal experience.

Eleven years ago I operated on a man, 42 years old, for a gastro-jejunal ulcer who for the very reason that because he had to suffer terribly from excessive vomiting for 5 days following two previous operations performed under *Bill-roth* mixture (the first gastro-enterostomy, the second to overcome adhesions) in spite of his most severe pains would not listen to a third operation. After the large *radical operation* of the gastro-intestinal ulcer which was begun in pure local anæsthesia and combined in superficial ether narcosis after the local had worn itself out (the operation lasted four (4) hours the *patient did not vomit once*. This caused him much pleasure and he could not understand how a patient had to suffer so much from nausea and vomiting after a short previous operation and did not suffer at all from vomiting in spite of the long duration of this operation).



We must not expect that vomiting, occurring during the *first 24 hours*, must be eliminated after operation under local anæsthesia. This vomiting is not the indication of gastric dilatation but is the expression of the individually varying reactions from the novocain, and above all, the morphin. Especially the latter is very important. For we see occasionally patients, who were prepared in the usual manner with morphin and for some reason or other the operation was postponed, who later in the afternoon or evening vomited which would likely cease within 24 hours. The accumulation of blood in the stomach after resections may produce vomiting on account of the nausea, and as a rule only changed blood in small quantities is raised. This type of vomiting ceases as a rule after 24 hours if the blood passes into the intestines or may be stopped at once by lavage which evacuates the foul smelling decomposed blood. Contrary to this the vomiting caused by gastric dilatation becomes more and more severe after 24 to 48 hours whereby *large quantities* of *clear* or *greenish fluid* are evacuated. It is possible to make the vomiting disappear and the dilatation to return to normal by repeated washing of the stomach.

Even intestinal atony in its severest forms is of rare occurrence where *general narcosis* is not used. If chloroform narcosis in our recent experience does not represent the sole cause of the atony it is still the most important factor even if temperature reduction, traumatic injuries to the intestinal tract play some part during an operation. For this reason *the severe forms of atony are completely absent in local anæ-*



*thesia*. In my own practice I have never experienced a case of atony of high degree which necessitated enterostomy. On the second day, as a rule, gas passes with a small quantity of faecal particles, after an enema; from the third day onwards, flatus and stool pass spontaneously. In women who suffer from constipation or in patients who possess extremely *long colons* the evacuation may be retarded to four days. Too much morphin, particularly *pantopon*, may retard intestinal function. The alkaloids must therefore be avoided as much as possible. For this reason I order *hot air* as much as possible for the post-operative pain which influences the bowel activity at the same time.

Under certain conditions retardation of the bowel function may take place after bowel resection performed under local anæsthesia also. In my opinion this is not due to general intestinal atony but rather to the fact that an intestinal suture means an *interruption of peristalsis*. On the other hand, a localized circumscribed fibrinous peritonitis while for the proper healing of the intestinal *section* is an *absolute* necessity causes an interruption of intestinal activity at the point of operation for some time. In these cases, in spite of the tympany, we are able to hear on auscultation active intestinal sounds above the point of resection and fecal particles in insufficient quantities may be evacuated from below the point of resection by means of enema at any time. In cases of obstruction the existing over-distention of the bowel interferes with the peristalsis and when long continued this may become entirely inhibited. We must not be surprised if bowel movements are re-



tarded even in such cases under local anæsthesia. In diffuse peritonitis the bowel function becomes normal only after the cessation of the infection. In both cases the *enterostomy* is performed at one or more points in order to relieve the over-distended intestinal loops and contribute thereby definitely to the process of repair.

I am unable to agree from my own experience that the *intestinal atony* is to be traced to an *infection* during the operation. Regardless of the fact that the infection is impossible in cases of intestinal atony where the peritoneum has not been opened, it must be explained in a different manner. This *infection from without* can hardly be considered the cause of simple bowel atony because such infections would naturally have suppuration of the laparotomy wound as a consequence and would, according to my experience, terminate in death in spite of secondary enterostomy. It might mean a *plastic fibrinous peritonitis free from bacteria*, very similar to a sero-fibrinous pleurisy in which the puncture fluid is *found sterile*. This plastic peritonitis leads to the formation of *fibrin flakes* or masses which cause *dense adhesions* of the various intestinal loops with its resultant interference with the intestinal activity.

If this *atony continues* there occurs just before death a *migration of bacteria through* the paralyzed and badly damaged intestinal walls. In such cases it is possible that we may find after 5 or 6 days the laparotomy wound healed *per primam* and a beginning general peritonitis. Surely in the production of this



exudate special *predisposition* must play a rôle, inasmuch as it cannot occur in every case.

Recently I saw just such a case operated on under ether by a colleague, a radical Bassini, both sides, in a 12 year old boy, no hernia sac at all on the left side, but the right sac contained a normal looking appendix which was removed. In spite of smooth post-operative wound *healing* without the slightest rise in temperature there developed a severe *intestinal atony* (absolutely no stool, no flatus) which finally after four days necessitated an enterostomy. By means of a pararectal laparotomy performed under local anæsthesia I found the bowels bound down by such dense fibrinous masses that separation of the ileum became so difficult that it was only by greatest care that injury to the bowel was avoided. By the administration of a brief ether-rausch the *greatest masses of fibrin* were found in the left hydrochondrium around the plica duodeno-jejunalis and the hepatic flexure, while in the small pelvis the exudate was scanty. On the right side where the appendix had been removed *perfectly normal findings were observed* in fact fibrin deposits were absent. The Bassini suture on both sides was not interfered with. By means of *two enterostomies*, on the right side in the lowest loop of ileum, on the left side at the junction of the jejunum and ileum, it finally became possible with the aid of intramuscular injection of 20 ccm. *neoharmonal* to restore intestinal ac-



tivity and save the boy's life. On account of consideration for the feelings of the father who was a doctor and was present, the fibrinous exudate was not sent for bacteriological examination. Thus we do not possess strict proof of clinical explanation that we had in this case a bacterial infection or a sterile fibrinous exudate.

The question of acute PERITONITIS is closely related to intestinal atony. Ten years ago in my examination thesis I formulated the view that we have to differentiate two kinds of post-operative peritonitis:

1. that form which occurs immediately after operation, and
2. that form which occurs 5 or 6 days after and can be clinically demonstrated.

The first form is due to *infection during the operation*, due perhaps, to a break in the asepsis, unsterile material or neglect on the part of the operator or his assistants. *Contamination of the operative field by the gastro-intestinal contents can take place only if the normal resistance of the peritoneum has been lowered* (progressive cachexia, severe hemorrhage, or long continued general anæsthesia). It is thus explained that by exclusion of general narcosis *general peritonitis* immediately after operation has become an *extreme rarity*, that it is an infection which is carried from without and proves fatal to the patient, for in my experience all methods of treatment of peritonitis (enterostomy, medicine, washing out of abdomen) are of no avail. In the exudate found in these cases



that have been reoperated, streptococci, staphylococci and bacillus coli were demonstrated. These cases are characterized *clinically* by an increased pulse rate occurring immediately after operation and remaining high, singultus, eructation, and vomiting which persists, sensitive abdominal walls, the passage of stool and flatus entirely suspended in spite of every medical effort.

The *second form of peritonitis* which sets in after 5 or 6 days, may be brought about by two different causes and thus present various clinical phenomena. In the first form of peritonitis the *insufficiently sterilized suture material* may be the cause of the infection. In this case the post-operative course may be uninterrupted, even may be termed *ideal*. Vomiting, if it occurs at all immediately after the operation, ceases usually after the first 24 hours; stool and flatus may be produced by means of enema after 48 hours and from then on may be passed spontaneously. The abdomen remains soft, retracted and not sensitive at any point. The pulse becomes normal after the second day if there was any rise at all. Only after the 4th, 5th or 6th day the *temperature* begins to climb, with slight chilly sensations, the pulse becomes more frequent and soft, the abdomen sensitive, hic-cough occurs which annoys the patient from the very beginning; stool and flatus which were passed spontaneously now become more difficult even after bowel irrigation and finally cease entirely. The abdomen becomes distended, vomiting increases more and more and finally fæcal matter is vomited.

The clinical course in these cases excludes a peri-



tonitis caused by suture leakage because in this form the course is quite different; here the symptoms appear suddenly as in gastric perforation and under stormy clinical picture quickly cause death. I have tried to save such patients by *reoperation* and by *enterostomies*. At operation it could be definitely established that the *slight peritonitis* present had its origin in the silk sutures that were intraperitoneal and formed small abscesses. The suture of the abdominal wall that apparently had healed *per primam* showed abscesses in the deeper layers, in the fascia and peritoneal stitches, in which streptococci and staphylococci could be demonstrated. For the origin of the peritonitis there is in my opinion only one explanation, namely, the *silk was insufficiently boiled*, the outer part was sterilized but the inner part, infected by the handling in its manufacture, was not reached in the boiling process. If silk is used as a ligature the immediate tissues are not infected at once, neither is the abdominal wall or the peritoneum, the clinical course in the beginning is absolutely normal. With the *swelling of the silk in the tissues* the bacteria in the inner portion come to the surface and at this moment infection occurs; those sutures lying in the peritoneal cavity causing peritonitis, those placed in the upper abdomen, the development of subhepatic abscesses and those used in the fascia, severe suppuration in the abdominal walls. If the silk is *wound around the spool in layers too tensely* an insufficient sterilization is to be expected because the deeper layers of silk are not penetrated by the boiling water or the boiling sublimate solution, *also if the silk is*



thick or *not boiled sufficiently* long. This last is relatively frequent; it is caused by the varying sizes of silk being boiled together for the same length of time. The thin bowel sutures become thoroughly sterile, while the thick silk which is used exclusively for sewing the fascia and also for tying off the mesentery, are not thoroughly boiled, which frequently causes suppuration of the belly walls. Only by avoiding entirely the use of heavy silk in the abdominal cavity, except perhaps where we must ligate the arteria gastr. sinistra at its origin in the cœliac axis with a heavier silk, but otherwise employ for the intestinal suture and ligatures only the finest silk can we explain why general peritonitis is so seldom when compared to suppuration of the abdominal wall. Insufficient sterilization of thin silk could be avoided positively if we made it a rule to have it *wound around the spool in single layers only*. In a gastro-enterostomy or cholecystectomy the surgeon who uses continuous sutures will employ but very little silk and therefore not use the deeper non-sterilized layers, while if he employs interrupted sutures the whole spool may be used. This can logically explain why, for instance, in a sanatorium one surgeon experiences late abscess formations, while another, who uses a continuous suture seldom sees this occurrence.

*Secondary peritonitis caused by suture material* is liable to occur in local anæsthesia also, in fact it can be more easily *demonstrated* than under general narcosis because the clinical picture, during the first days after the operation up to the time of the begin-



ning of the infection resulting from the swelling of the silk cannot be obscured by a severe post-operative gastro-intestinal atony as may be observed after general anæsthesia. The best remedy to *avoid* this fatal peritonitis is *principally to use silk wound in a single layer, of finest quality, boiled sufficiently long*; personally I have observed in my gastric resections four (4) cases of secondary peritonitis that could undoubtedly be traced to the silk suture material. All of them showed the same clinical course. After a relatively smooth and simple resection absolutely no drawbacks in the first 5 days, normal stool and flatus, no temperature, but on the 6th day beginning of abdominal symptoms, with elevation of temperature and chills, increasing evidences of peritonitis. At re-operation on the 7th or 8th day beginning *peritonitis, abscesses around ligatures of the duodenal stump*, in the omentum and in the fascia sutures. The anastomosis sutures themselves perfectly intact, as also in the duodenal stump.

The *second form of secondary peritonitis follows acute intestinal paresis*. It was relatively frequent during the time of deep general narcosis, particularly with pure chloroform, but also with *Billroth* mixture, though it was not appreciated for a long period. In its clinical course this form of peritonitis can be easily differentiated from the primary infection at operation with resulting peritonitis. While the pulse remains high after the operation in the latter form, the abdomen is sensitive to pressure and distended, continuous singultus and vomiting exist. The picture of the first form of peritonitis is exclusively the pic-



ture of intestinal atony, that is, the abdomen is tympanic, but not sensitive to pressure, the pulse is full, strong and slow. Only with the progress of the atony the pulse becomes gradually worse, on the 4th or 5th day very similar to the pulse of peritonitis, the abdomen sensitive at all points. If *reoperation* is done the intestinal loops are found greatly distended, the serosa slightly reddened in stripes, perhaps a little fibrinous exudate. At the autopsy the *amount of exudate* found is *remarkably small*, so remarkable that sixteen years ago, in the clinic *Hochenegg*, I saw such cases on the post-mortem table. The question repeatedly arose, why such a mild peritonitis with so little exudate should end fatally while violent forms of peritonitis which occurred without operations, for instance after appendicitis, spontaneously recover? The post-mortem records show mostly only *beginning* fibrinous peritonitis and the cause of death usually cardiac paralysis, in so far as the pathologist himself can form an idea of the cause of death. If we analyze these cases correctly from a clinical standpoint, it is possible for us to find in them a high degree of post-operative intestinal *atony* with absolute cessation of stool and flatus, with distended but not sensitive abdomen. These are the cases where a timely performed *enterostomy* at one or more points would save the patient who otherwise would die of intestinal auto-intoxication and the result of pressure upwards of the diaphragm, where at the autopsy only a beginning peritonitis is found. There have been cases reported in literature where such forms of peritonitis were caused by enterostomy. I know per-



sonally of several such examples which were operated on by other surgeons for chronic appendicitis, myoma, cholelithiasis under general anæsthesia, which by means of a secondary enterostomy could have been cured of this peritonitis. There are just such cases of severe intestinal atony, beginning peritonitis as a result.

*In my operations under local anæsthesia these secondary forms of peritonitis following intestinal atony are absolutely wanting, because the high grade intestinal atony is entirely absent. This is a reason why the number of cases of peritonitis have become so remarkably small in my operations under local anæsthesia, as will be reported in the individual operations later on. Cases where the symptoms of peritonitis actually occur about the fifth day as a result of poorly sterilized suture material are in my experience absolutely lost. I have never been able to cure a post-operative peritonitis by enterostomy like other surgeons, because in all my cases which ran a fatal course, I had to deal with bacterial infection from without.*

These experiences of mine during the last ten years have shown that my views are correct, namely, *as a result of the substitution of local for general anæsthesia the number of fatalities due to post-operative peritonitis can be most remarkably lessened because the natural resisting power of the peritoneum is not damaged*, so that the infection which comes from the gastro-intestinal contents is easily overcome; that deaths also from secondary peritonitis resulting *from intestinal atony* are entirely absent. The investigations which began before the war to prove scientifi-



cally by animal experiment the correctness of my theory, quite similar to *Snell* who at the time proved the correctness of his views of the damages to the resisting power of the lungs, could not be continued on account of the tremendous cost of animals for experimentation. Since these experiments are absolutely necessary to strengthen our teachings, I have repeatedly pointed out the clinically proven factor to surgeons from America who were with me as assistants and hospitants for long periods of time, and encouraged them to carry out those experiments.

*By local anæsthesia the frequency and, particularly the severity of PULMONARY COMPLICATIONS, can be reduced.* This assertion is in direct contradiction to that of *Gottstein* and *Henle* which, even to this day, is quoted as dogma by many surgeons without further investigation, namely *that local anæsthesia does not diminish the appearance of pulmonary complications, that on the contrary the Schleich anæsthesia directly promotes the occurrence of pneumonia.* *Gottstein* promulgated this view in an article published in 1898 in which the material from the *Mikulicz* clinic was utilized, and based his opinion upon the comparison of the operations done under general and local anæsthesia in the previous years. Among 114 abdominal operations under local anæsthesia *Gottstein* found a morbidity in lung complications of 13%, while in the year 1895 among 119 laparotomies under chloroform 5.8% and among 207 laparotomies, 1896-98, 1.8% pulmonary complications were observed.

To quote verbatim: "This reduction from 5.8% in the year 1895-96 to 1.8% in the following year un-



der chloroform is easily explained; for only such cases were operated on under local anæsthesia of which it was assumed at the start that they could not stand general narcosis." Therefore, the 207 cases operated during 1896-98 under chloroform had, relatively speaking, the greatest resisting power. "If we contrast the percentage in chloroform narcosis 5.8% and 1.8% of all lung complications with those under local anæsthesia (13%), we find the number of lung complications exceptionally high, so that one cannot help being impressed with the idea that *Schleich's* anæsthesia promotes the production of pulmonary complications." This assertion serves the advocates of general anæsthesia and the opponents of local anæsthesia as the main pillar of support in the theory that local anæsthesia can accomplish no more than general anæsthesia. An injustice is being done *Gottstein* if this statement is used in that sense, because *Gottstein* himself renders his first assertion valueless when a few lines further on he writes: "But we must always take into consideration that abdominal operations performed with *Schleich's* anæsthesia mean the most complicated difficult cases in surgery and it is for this reason that the number of lung affections is increased. Lately many patients have been operated on under *Schleich's* anæsthesia who under general narcosis could not have been operated on at all on account of the great risk. Therefore it would be a mistake to speak of a cocain pneumonia as we do of a narcosis pneumonia, especially an ether pneumonia."

*Henle* tried to give a reason for the more frequent



*occurrence of pneumonia* following local anæsthesia. He pointed out that while after gastrostomy under local anæsthesia the pulmonary complications are less frequent than the operation under general narcosis, yet these occur more often in gastro-enterostomy and gastric resections. *Henle* explains this by the supposition that narcosis causes a certain amount of damage, but in the major operations this is not as important as the weakening of the heart and general organism through pain, excitement, etc. The operations which can be performed quite painlessly under local anæsthesia cause little or none of these bad influences, and produce therefore under infiltration better results.

This explanation is a purely subjective assertion of *Henle* which cannot be verified. It is also quite superfluous if we take the actual facts into consideration. It is correct that the *morbidity of pneumonia* in gastrostomies, performed under local anæsthesia, is less than in cases operated under general, that in *gastro-enterostomy* the morbidity (but not the mortality) is decidedly greater. This explanation is intimated by *Gottstein* in a postscript to his first report. Local anæsthesia is easily performed in gastrostomy, produces complete painlessness, analgesia is therefore almost always employed in those cases where general anæsthesia was still possible. For this reason the *number of gastrostomies* done under local *outnumbers those under general anæsthesia*. Local anæsthesia was employed in those cases of gastro-enterostomy and gastric resections only where general anæsthesia had become impossible on account of se-



vere diseases of the heart, the lungs, progressive cachexia, etc., where therefore, as *Gottstein* himself says, without local anæsthesia *these cases would have to be refused operation*. It is natural that in gastrotomy, where although the still strong and otherwise healthy individuals were no longer narcotized, the morbidity in pulmonary complications is reduced because in the majority of cases no lung diseases existed before the operation.

*In gastric resections*, in the material in the *Mikulicz* clinic, *local anæsthesia* was the *exception* and employed in those cases only that could not take general anæsthesia on account of pulmonary disease, etc. Hence the number of resections done under general anæsthesia is much greater (62 cases) than the number done under local (14 cases). It is therefore logically to be expected that the *morbidity in pulmonary complications* in resections under chloroform with 17.7% must be less than in the operations under local anæsthesia where it actually amounts to 28.5%. It cannot be expected that the already chronic purulent bronchitis should suddenly be cured by resection, so that it did not exist any more after operation; on the contrary, it is almost self-evident that on account of *insufficient expectoration* retention of the secretion takes place and therefore lobular pneumonia sets in. In simple gastrotomy where an incision of only 2-3 cm. long is made through the left rectus muscle, the pains caused by coughing are much less than in resections with large median incisions. Therefore the patient will expectorate without difficulty after a simple gastrotomy, while, on the contrary, after re-



section the patient not only has to be asked repeatedly to breathe deep and cough vigorously in spite of pain, but he must have the support of the nurse besides. Should this not be looked after carefully the number of lung affections is much increased. *It is therefore absolutely necessary to attribute these pulmonary complications to heart trouble caused by pain, as was done by Henle.*

The lung affections gradually disappear. Although they were the cause of pain, they were otherwise of no consequence. *The end result only is decisive whether the patient recovers or dies from his pulmonary disease.* Now the material from the *Miculicz* clinic which *Gottstein* used as a basis for his remarks shows that the *mortality of pulmonary complications* in operations done under general is *much greater than in operations* done under local anæsthesia not only in the simple gastrotomies, where the morbidity is known to be greater, but also in gastric resections where the *morbidity* after ether narcosis is smaller. In the material from 1896-1900 according to a communication from *Miculicz* (*Arch. f. Chir.*, Bd. 64, S. 757) in 27 gastrotomies operated under general anæsthesia the morbidity was 11.4%, the mortality 7.4%, while among 90 gastrotomies under local the morbidity was 7.8%, the mortality on the contrary was only 1.1%.

Quite remarkable is the difference in the mortality in gastric resections in the *Miculicz* clinic. In 62 resections done under general the morbidity was 17.7%, the mortality in pulmonary diseases was 12.9%, while among the 14 operated under local the



morbidity was 28.5%, the mortality on the contrary was *nil*.

When we consider that according to the personal communication of *Gottstein* only the cases were operated in local anæsthesia in which on account of the weakness and the bad general condition of the patient, and on account of existing pulmonary disease, a general anæsthetic could not be risked, that from these particularly bad cases operated in local anæsthesia not one individual case died from pulmonary disease, while among those cases who possessed robust and healthy organs operated on under *general anæsthesia* 12.9% died from *lung complications*, we must admit that the material from the *Miculicz* clinic affords an *absolute* proof that the dangers of lung complications and their resultant deaths are *very materially reduced*; and this is the most important point of all. This fact need not surprise us, because by local anæsthesia the *heart* is not affected as it is from chloroform and also from long-continued ether anæsthesia which according to *Koenig's* investigation from the *Kirscher* clinic exerts the same harmful influence as chloroform. The *prognosis* in pneumonia, especially lobular pneumonia, depends in the first place upon cardiac efficiency. For this reason we must endeavor to *protect the heart as much as possible*, and this can be surely accomplished by the avoidance of general narcosis.

*The much quoted sentence* that the dangers of *lung complications* are not influenced by local anæsthesia *is found incorrect by the comparison* of the decidedly unequal figures. It is to be regretted that it is repeat-



edly quoted as a dogma without the authors taking the pains to prove the correctness of the citation, the inconsistency of which I have so often pointed out. It should disappear from literature because of its absolute falsity.

The incorrectness of this sentence cited by *Gottstein* is also confirmed by a report from *Reinhard*. In order to be able to compare the relative worth of local and general anæsthesia *Reinhard* operated on a series of 150 similar cases of the same diseases, with the same kind of operation; one series under general and the other under local anæsthesia. He was able in this manner to again prove that *local is far superior to general*. *While the mortality from pulmonary complications was 12.6% under general, in those operated on under local it was 0%.*

*In my cases* the superiority of local anæsthesia in regard to the mortality from lung complications is again demonstrated. I have not seen one fatal case from pneumonia complications among my 460 resections for gastric or duodenal ulcer, although *no case* of resection was excluded, even if there existed before the operation a chronic suppurative bronchitis, severe heart lesion, or if the patient was over sixty years of age. There is one fatal case only to be found among the resections, done for *most acute hemorrhage* where, *with* the severe anæmia and highly developed arterio-sclerosis (old Syphilis), there existed a lobular pneumonia.

The case was that of a 57-year-old man who suffered from gastric complaints for 30 years,



who had severe tabes, was very much emaciated (weight 37 kg.) and who came to operation in an almost exsanguinated condition with a severe suppurative bronchitis. On account of severe anæmia the patient was obliged during 24 hours to lie with the head lowered, a position unfavorable to expectoration; besides which the patient received in the military hospital against my expressed order an injection of morphin, so that the tendency to cough was completely arrested. In a case of this kind no surgeon would operate under general anæsthesia. We must not be surprised if lobular pneumonia sets in in such a case, which in a strong patient would have been easily overcome by strenuous expectoration.

It is correct that *neither chloroform nor ether* by themselves, provided severe reduction of the temperature is *avoided*, can produce pneumonia. But the entrance of bacteria normally existing in the bronchi as well as the germs which by aspiration of the saliva from the mouth find entrance into the bronchi, is facilitated by the narcosis. The interesting experiments which *Snell* made 20 years ago in the clinic *Talma*, in Utrecht, affords the explanation for this. He was able to show that the normal *bacterial resisting power of the lungs was destroyed by a long continued* narcosis and this facilitated the entrance of the germs into the tissues. *Snell* experimentally introduced cultures of anthrax into the larynx of animals. While the animals which were not narcotized



and those which were under the anæsthetic for  $\frac{1}{4}$  of an hour remained alive, all those narcotized for an hour or more succumbed to anthrax infection. *Snell* was able to demonstrate by these experiments that the danger of narcosis, particularly as regards pulmonary complications, increases with the duration of the narcosis, but that there is no difference between chloroform and ether with reference to the occurrence of lung infections. It is also proven by animal experiments that a long continued narcosis directly favors the production of lung infection, a fact clinically known for a long time. The fatal result is closely connected with the degree of cardiac damage done by the narcotic agent.

General anæsthesia of course is not the only cause of pneumonia. For pneumonia is observed after operations in which no anæsthetic was used, yet even where no operation has been done at all. In *croupous pneumonia* chilling plays a very important part. In the last few years we have observed repeatedly that the cases of pneumonia have increased in the Vienna hospitals on account of deficient heating during the winter. Chilling on the operating table and especially after operations, if the patients have perspired, must be avoided absolutely. The transportation of patients over long, unheated corridors may act harmfully if the patients are not sufficiently covered. In the Garrison Hospital No. II. I have repeatedly seen croupous pneumonia after simple hernia operation performed under local anæsthesia; fortunately all of them recovered, while in laparotomies there was none. The hernia patients had to be carried through poorly heated



corridors to distantly situated wards while the rooms of those who had laparotomies done were in immediate proximity of the operating room. That the number of pneumonia cases should be increased during an *influenza epidemic* is self-evident. *Hohlbaum* makes this responsible for the high mortality (11%) observed in the clinic *Payr* in gastro-enterostomy for duodenal ulcer.

An extremely much more important factor in the production of post-operative pneumonia is found in the *retention of the secretion resulting from deficient expectoration*. This retention is observed most frequently after *laparotomies in the upper abdomen* on account of pain. If a chronic purulent bronchitis with emphysema is present before operation, as is frequently the case in old people over sixty, insufficient expectoration is enough to cause a diffuse lobular pneumonia within the first 24 hours. The extremely important lesson to be learned from this is, that especially *these old people*, even when operated on under local anæsthesia must be taught to begin *systematic deep breathing immediately after the operation* and must be made to cough regularly by the nurse in charge. In order to lessen the pains the nurse must be instructed to use suitable measures, to protect the laparotomy wound from bursting by placing the flat of the hands on each side of the abdominal muscles preventing even slight separation. In old people with little elasticity of the thorax *the surgeon* must at times aid the expectoration *by compression of the thorax*. In this manner one can achieve success even in very doubtful cases.



Last year, in a very much emaciated man 64 years old, on whom I had performed a gastric resection under local anæsthesia to exclude a large irremovable duodenal ulcer, I was obliged to resort to forced respiration because the patient on account of pain was unable to expectorate and showed dullness over both lungs and a temperature of over  $39^{\circ}$  R. After prolonged effort, whereby a rib was fractured, we finally succeeded in establishing expectoration and thereby saved the man in spite of the double-sided infiltration. Besides the mechanical *treatment the strict supervision of the heart action* is of especial value. This should be done by specialists (internists). Undoubtedly those cases with doubtful prognosis from post-operative pneumonia due to very bad heart action, can be saved. If one does not exclude old people with severe lung diseases from operation and at the same time expect to get good results, then the *exact after-treatment is at least* as important as the strict attention to the details of asepsis during operation. Local anæsthesia alone is unable to *prevent the occurrence of pneumonia in these cases but it can reduce its dangers*. By proper after-treatment only is it possible to prevent the formation of pneumonia areas where bronchitis already exists, or if it occurs, the healing of the pneumonia is favored. The opponents of local anæsthesia might consider these facts seriously when they continue pointing out that pneumonia occurs even after local anæsthesia, that therefore the efficacy of the same is problematic.



#### IV. Indications and Contraindications for Local Anæsthesia and General Narcosis

The reasons advanced in the foregoing chapter have caused *me to limit* general anæsthesia, also ether, as much as possible and in the major operations *to refuse to employ it altogether*. This attitude towards a patient was interpreted in many instances in such a manner that I *force* the patient directly to be operated on under local anæsthesia and that I commit a great wrong in so doing. I must expressly emphasize here that *I do not exercise any undue influence whatever*. He who declines to be operated on under local anæsthesia is at liberty to go to any other surgeon who performs major operations under general anæsthesia. I leave this decision to the people themselves and direct them to such surgeons. Inasmuch as I have no service in a public hospital in which every patient must be received who needs operation, only those patients are received in the private hospital, the Franz Josef Ambulatorium and the Barmherzigen Brüder Spital, who agree that only local and not general anæsthesia shall be used in their operations. Moreover it is my privilege in my private practice to send away patients who demand general anæsthesia. This may be considered unwise in my own interest and causes me many financial losses, but it is done solely in the interest of the patients. For, if one is prepared to operate under local anæsthesia where time is of secondary consideration, an operator will be just as exact in the placing of the gastro-intestinal sutures under general as in local anæsthesia. The sutures



will be absolutely secure but the duration of the operation will be prolonged and the dangers of the narcosis increased. For this reason I send away all patients who demand narcosis, even for the beginning of the operation.

If one explains to the patient frankly the nature of the operation and its dangers, it is usually possible to gain consent for the operation under local anæsthesia, even in the less intelligent patients. I am not of the opinion that anyone has the right to misrepresent to the patient that *narcosis* is absolutely *harmless* and to shift the blame of its dangers after the operation entirely upon the operation itself as unavoidable. To the question which every patient asks before operation, whether the operation is dangerous, I reply to all invariably: on the one hand every operation carries certain elements of danger with it which arise from the nature of the pathology and the kind of operation and the harmful influences of the narcosis on the post-operative course (lung diseases, cardiac insufficiency, liver disturbances, etc.), and on the other by accidents during the operation itself for which the operator is in no way responsible (insufficient sterilization, break in the technique).

*The chief dangers of every major operation are due to general anæsthesia and its harmful results.* If it is possible to exclude it entirely or to reduce it to a minimum, the accidents during the operation still remain. These dangerous elements are today not *any greater* in a well conducted institution than the dangers of traveling in a railway train. If we explain to the patient frankly and quietly, in this manner,



and not only assure him that the complete operation can be performed painlessly, but if he has heard this from other patients you can further assure him that in case the local anæsthesia is not complete ether will be administered as an aid. Naturally very little being required, it is always possible to receive the patient's consent to the operation under local anæsthesia.

The so-called *psychical excitement, nervousness, etc.*, which are held as contra-indications to local anæsthesia by many operators, do not play any particular part according to my experience, provided these patients have been prepared by somewhat large doses of alkaloids (0.02 pantopon one hour and 0.01—0.02 morphin with 0.0005 atropin one-half hour before operation). I have repeatedly observed that people who were considered especially nervous before operation (mostly on account of the long continued pains in ulcer) where the house physician and internist advised against the beginning of the operation under local anæsthesia, became quieted down by such preliminary preparation, so that the whole resection could be done without the aid of the slightest amount of ether which had been promised previously. Naturally, a good anæsthesia is presumed where pain is really absent. The so-called psychical shock therefore does not develop.

In a young person with healthy viscera, who absolutely demands it, I permit exceptionally the operation to be begun under *ether narcosis, in drop doses*, but make the *abdominal wall anæsthesia* complete before the exciting stage sets in. I then suspend the narcosis completely, perform the laparotomy and for



the deep anæsthesia (splanchnic anæsthesia) administer a little more ether, thereupon all general narcosis is suspended entirely. In many cases it does not come to even a superficial narcosis. Since ether at the start is unpleasant to many, they ask that the mask be removed and decline any further narcosis. In the discussion of the individual operation method these cases are cited where in the beginning of the operation general narcosis was employed. They are somewhat more numerous in minor (appendicitis, etc.) than in major operations. This combination of superficial ether narcosis with subsequent local anæsthesia may be called *combined anæsthesia* in those cases where the quantity of ether used exceeds 100 ccm. For this combination ether only should be used as the combination of chloroform with the alkaloids, but particularly with adrenalin, considerably increases the dangers of the individual components.

I agree with the combination of beginning narcosis with subsequent local anæsthesia in cases of *appendicitis* or *gall stones*, in *young patients* who expressly wish it. In gastric resections, particularly in operations for peptic ulcers of the jejunum, I try to avoid the preliminary use of ether, because here, on account of the long duration of the operation, the ether narcosis may become a necessity anyhow.

*If the patients are over fifty years old I decline the preliminary use of ether as absolutely superfluous* and on account of the already existing chronic bronchitis and beginning emphysema consider it harmful since I cannot accept *Schnitzler's* view, that ether is not at all dangerous in old age and in lung diseases, and



that deaths from pneumonia do not occur at all as a consequence of narcosis, an opinion that is in direct contradiction to the accepted teachings of *pharmacology* and internal medicine. If during the course of the operation a temporary ether narcosis becomes necessary on account of insufficient local anæsthesia or the long duration of the operation then I allow ether to be used, but the increasing dangers have to be taken in the bargain as inevitable.

Pronounced *obesity* certainly can render the administration of local anæsthesia difficult and make its thoroughness questionable. In spite of this I am of the opinion that just in these cases where a *fatty heart* is present local anæsthesia is particularly valuable because in playing the greater part in the "combined anæsthesia" it saves a good quantity of the narcotic and thus can be of great advantage to the heart. Very naturally in obese patients  $\frac{1}{4}\%$  *novocain solution* is used instead of the  $\frac{1}{2}\%$  whereby larger quantities of solution can be used without increasing its toxicity. We can discard the subcutaneous injections around the field of operation in cases of median laparotomy, the skin of the line of incision is infiltrated *intracutaneously* according to *Schleich's* method of infiltration anæsthesia. Then the fat, which is painless, is easily divided. After the skin incision the muscles are infiltrated, which is also advisable because the resistance of the fascia is not always pronounced enough to estimate the correct depth. For this reason it becomes necessary after the abdomen is opened to inject the peritoneum and the posterior rectus sheath from within ( $\frac{1}{2}\%$  solution). The *splanchnicus anæsthesia*



is possible in very fat individuals but demands greater amounts of solution so that it is best administered in a  $\frac{1}{4}\%$  solution whereby a perfect action is not obtained in all cases, besides the anæsthesia is of shorter duration. Ether must be used as a temporary aid, therefore a combined anæsthesia is employed which is much more advantageous than the exclusive deep general narcosis.

*Inflammations in the abdominal cavity* form no contra-indication against the use of local anæsthesia, at least as far as the belly wall is concerned. In the deep structures themselves no injection is employed, but for this ether is administered, therefore a combined procedure is maintained.

In children also local anæsthesia can be successfully used. Naturally there must be a thorough understanding before using. Frightened children, who cry when brought into the operating room must naturally be narcotized, yet it is still possible to inject the abdominal wall with  $\frac{1}{4}\%$  novocain and thus reduce the quantity of narcotic. In many cases it is possible to perform the operation without deep anæsthesia after injection during the superficial ether administration, provided the child suffers no pain and his attention is otherwise attracted, best done by offering sweets.

Nine years ago in the clinic *Hochenegg*, I operated on a boy 8 years old, who had been operated two (2) years before for acute appendicitis, in whom it became later necessary to perform cæcostomy for obstruction so that the bowels moved continuously through the fistula.



Inasmuch as the child had become very much emaciated and *tuberculosis of the lungs and bones (tibia)* existed, another operation was advised against by several surgeons on account of the bad risk for general anæsthesia. The attempt to operate on the child under local anæsthesia appeared to become a failure because with the first introduction of the needle, the child began violently to remonstrate and cry so that we were obliged to give ether. After the conclusion of the belly wall anæsthesia the ether was suspended so that the child awakened. He was entirely quieted down. The whole operation (resection of the cæcum, suture of the cæcum, closing of the large ventral hernia) was performed without renewal of the general narcosis, whereat the boy several times inquired what was being done to him.

As a rule it is enough to attract the child's attention to other things when the anæsthesia is actually complete. During the course of an influenza epidemic it is exceedingly valuable if one can operate on a case of appendicitis without general narcosis. It is even so much more important in doubtful cases when the differential diagnosis between a beginning lung affection and an appendicitis cannot be established with absolute certainty.

That young physicians may be *trained in the technique of anæsthesia* as a reason for the employment of general narcosis, which was also mentioned by *Braun* in his discussion in the last Congress of Surgeons as



a reason why general narcosis should be practiced, can hold water only in minor operations (appendicitis, hernia, etc.) and in young people, since we must be guided by the point of view never to cause harm. The training in the technique of general narcosis with the exclusive use of ether is not so difficult, it can therefore be accomplished in a few cases. In the employment of ether for the occasional aid in local anæsthesia the principal point *is to save as much ether as possible*, principally not to exceed the exciting stage. This is easy to accomplish since after the exact anæsthesia of the abdominal walls the intraperitoneal attack causes very little if any pain. Physicians in sanatoriums are only too easily influenced to narcotize the patient so profoundly just as if no anæsthesia of the walls had been made. This is absolutely unnecessary and requires large amounts of ether. The nurses and soldiers who were called upon to administer ether during the war in the Garrison Hospital No. II, as a rule, used much less ether than the physicians in private hospitals. 30 to 40 ccm. ether usually sufficed for the entire operation (2 to 3 hours) for resection.

Apparent heart, lung and kidney affections, severe anæmias, advanced cachexia are for me absolute indications for the employment of local anæsthesia. Advanced age (over 50 years) is even without any organic disease an absolute reason for the employment of novocain anæsthesia. In major operations (gastric resection, intestinal resection, etc.) in young and robust people local anæsthesia on account of its superiority over general anæsthesia is absolutely to be recommended. Should the beginning of the operation



under local anæsthesia be refused then in order to shorten the duration of the narcosis and lessen the amount of ether it is recommended, in spite of the general anæsthesia in the beginning, to employ exact conductive anæsthesia of the abdominal walls and also of the deeper parts. Minor abdominal operations (chronic appendicitis) in young people can be performed under brief ether narcosis. During an influenza epidemic the most possible exclusion of deep general by local anæsthesia is to be recommended.

#### V. General Considerations of Solution and Technique of Injection

To obtain a good anæsthesia on the one hand and to avoid bad accidents on the other requires an exact course in the technique of injection. The best and relatively least harmful medicament is novocain, discovered by *Einhorn*, used for the first time as a local anæsthetic by *Braun* in Zwickau, in 1905, and since then not only in Germany but also in France it has become generally accepted. Since its action is short *Braun* recommended an *addition* of adrenalin to increase its action and prolong its duration on the one hand and also on the other to avoid poisoning by too rapid absorption. Novocain is now made in the United States. Tablets containing novocain and suprarenin in definite proportions are on the market. The most frequently used are the *tablets A*, each tablet contains 0.125 novocain hydrochloride and 0.000125 suprarenin. When four tablets are dissolved in 100 ccm. physiologic salt solution a  $1\frac{1}{2}\%$  solution is obtained, which is used almost exclusively in ab-



dominal operations. Inasmuch as novocain is a poison a very exact dosage corresponding to the strength and weight of the patient is essential. Therefore instead of a  $\frac{1}{2}$  of 1%, a  $\frac{1}{4}$  of 1% novocain solution is recommended (2 tablets to 100 ccm. physiologic salt solution) in severe exsanguinated and cachectic patients. A  $\frac{1}{4}$  of 1% solution, of which a greater amount can be used, is recommended in very fat patients, at any rate for the belly wall. The tablets B, C and D, which are only distinguished from one another by the amount of suprarenin they contain, have fallen into disuse. In large hospitals novocain in powder form can be used in the preparation of the solution. Of course a corresponding quantity of adrenalin must be added. Other remedies, such as alypin, tropococain, eucain, etc., I have never employed, since according to past experiences they have shown themselves to possess more toxic action than novocain. The so-called *Schleich's* solution is used by many surgeons in local anæsthesia even today. Since it acts as a hypotonic solution principally by swelling of the tissues, it can be used only for infiltration at the local point of incision but not as a proper conductive anæsthesia.

The "*quinine-urea*" employed with such success in America acts according to my experience by *direct infiltration* only, not as conductive anæsthesia. I could not obtain sufficient anæsthesia during hernia operations in which I tried the American preparation, before the war. Therefore the reports of the anæsthesia lasting several



days astounded me. Of course those 2,000 cases reported by *Saphir* according to Prof. *Demont* in Berne were operations on the rectum (hemorrhoids, fistula, etc.) where infiltration and not conductive anæsthesia was used. The anæsthetic effect of the quinine preparation is proven by the works of *Schepelmann*. The practical value in abdominal surgery may become questionable on account of the amounts of the solution necessary. Because of the advantage of continued anæsthesia for 10 days, especially in midline laparotomy in the interest of easier expectoration the use of the remedy should be preferred. But here as well as in hernia operations the healing of the wound is decidedly interfered with.

The *novocain solution* must be always freshly prepared as through long standing especially when exposed to light it decomposes, becomes red, ineffective and more toxic. The *red color* is due to the decomposition of the *adrenalin*. As adrenalin increases the action of novocain it also prevents too rapid absorption and hence the occurrence of toxic symptoms, it must always be present in the solution in sufficient quantity. Therefore *solutions which have turned red are useless*. In spite of this they are often employed, wherefore we must not be surprised to get not only bad anæsthesia but also toxic symptoms. Decomposition of adrenalin is best prevented according to *Braun* by acidulating the normal salt solution slightly, by adding 3 or 4 drops of diluted hydrochloric acid to 1,000 ccm. physiologic salt solution. Vessels and syringes used in local anæsthesia must *not be boiled in soda solution*



but in distilled water. Novocain can be boiled in the acidulated salt solution to make the asepsis more perfect. Since boiling of the novocain solution does not lessen its efficacy, it improves the asepsis.

*Hoffmann and Kochmann* have recommended the addition of 0.4% potassium sulphate in order to increase the action of novocain. This increased efficiency of the anæsthetic is confirmed by *Braun*. I have used this solution repeatedly but never could convince myself of its increasing the duration of the anæsthesia. Upon boiling the solution a brown discoloration may form. This solution, contrary to the red solution, may be used.

By the addition of 0.5 quinine sulphate to 100 gm. of a  $1\frac{1}{2}\%$  novocain solution, it is possible to increase and prolong the action of the anæsthesia. There are at present experiments being made to obtain a longer (several days) duration of painlessness of the abdominal sutures by injection of the combination of novocain-quinine solution in the abdominal muscles. The use of quinine in splanchnic anæsthesia appears to me on account of the possibility of a longer continued injury to the splanchnics (gastro-intestinal atony) at the time as too dangerous. But after employment of the solution for the abdominal walls the post-operative pains are remarkably little so that perhaps with the combination of quinine with novocain rarely *lasting anæsthesia* of many days can be obtained, which for the severe coughing and with it for the avoidance of retention pneumonia would be of quite particular importance.

*The amount of novocain and the concentration of*



*the solution should always be determined by the constitution of the patient.* As a rule 150-200 ccm. of a  $\frac{1}{2}\%$  solution suffices for a major abdominal operation. Thus (0.5g.) the maximal dose of novocain is exceeded (0.8), yet I have never observed any bad effect. *Braun* also employs 100-250 ccm. of a  $\frac{1}{2}\%$  solution. That it is possible to use 1-1 $\frac{1}{2}$  gm. novocain, even up to 3 gm. in  $\frac{1}{2}\%$  solution without ill effect, in paravertebral conductive anæsthesia, as *Siegel* reported, seems to me possible only in very strong individuals.

In injecting the solution we must always pay particular attention to *avoid, absolutely, intravenous introduction* of a large quantity of novocain as it can cause very severe toxic symptoms and sudden death. This unwished for intravenous injection can be best avoided by making it a rule *never to inject with a motionless needle*, but to keep moving the needle during the injection, shoving it to and fro all the time. If it so happens that we do strike a vein and inject a few drops of novocain solution, no harm is done. By moving the needle to and fro it is hardly possible to penetrate the vein anew and make an intravenous injection. Especially *must we observe this rule when we inject in the region of large veins* (varicocele, goitre). If it is necessary to inject with the needle motionless, as for example, in splanchnic anæsthesia, where a certain bone is taken as a land mark, we must be thoroughly convinced by aspiration, by increased venous pressure in consequence of lowered pelvis, that the needle point is not in a vein, from which venous blood will flow.



One part of the poor success experienced by surgeons operating under local anæsthesia is that the operation is begun too soon after the injection. *Novocain requires a certain time until it reaches the nerves and penetrates the tracks of diffusion* by which the interruption of conductivity is established. The thicker the nerve trunk is, the denser the surrounding tissue is, the longer it will take before a complete loss of sensation occurs. As a rule it is wise to wait at least 5 minutes before incising the skin, and for splanchnic anæsthesia more time is required.

## VI. Sensibility and Innervation of the Abdominal Cavity

In order to obtain good anæsthesia it is necessary to possess an exact knowledge of the nerve supply of the abdominal cavity. We know from clinical observation in operations under narcosis that the *parietal peritoneum of the anterior belly wall is most sensitive to pain*. That is why we must have profound anæsthesia in order to open and later to suture it. This extremely important fact must be quoted again and again for the appreciation of the value of local anæsthesia. The tugging on the viscera causes pains of course, but these are less intensive than the pains produced by contact with the anterior abdominal wall. The manipulations of the viscera (stomach and intestines) are generally considered absolutely painless provided every traction is avoided. According to *Lænnender's* investigations in abdominal operations the mesentery itself is said to be insensitive to pain and only the peritoneum of the anterior and



posterior abdominal walls is painful. This view of course is contradicted by the observations of more recent authors.

By the experiments of *Frölich and Meyer* it has been shown that severe distention as well as lively contractions of the intestines in animal experiments, are at least able to cause pain, which, according to the kind of experiment cannot be explained by the simultaneous tugging on the mesentery. Upon the basis of our *clinical observations* we are in a position to state that the *viscera themselves*, at least practically, *are not sensitive*, an opinion that is confirmed by the recent investigations of *Arthur W. Meyer*.

By the *experiments of Neumann and Kappis* it was established that the pain conduction of the abdominal viscera is along well defined tracks, which travel from the organs along the great vessels to the sympathetic ganglia, from here in the lumbar cord by way of the rami communicantes to the 1-3 lumbar nerves and in unison with these enter the spinal cord, while they are united in the dorsal nerves in the splanchnic major and minor and from here by way of the rami communicantes to the 6-12 dorsal nerves and with them enter the spinal cord.

The innervation of the individual regions of the abdominal cavity and the viscera shows a *segmentary* arrangement even if the individual segments are strongly interwoven. By means of animal experiments by *Kappis* and others it is established that the *uppermost limit* for the innervation is the *6th dorsal segment*, because after severing the spinal cord at this point a complete anæsthesia of the abdomen occurs.



*Kappis* further emphasizes that the visceral sensibility is not only segmentarily arranged but also that it is *bilateral*, for which reason the rami communicantes of both sides must be interrupted to obtain complete anæsthesia. Only in organs arranged in pairs (kidneys) one-sided anæsthesia suffices.

Since all the rami communicantes from the 6th dorsal to the 4th lumbar segment must be interrupted, which is very unpleasant to the patient on account of the 20 needle punctures, and since the relatively large doses of novocain are not harmless, the effort has been made to define the *nerve supply of the individual* organs in order to interrupt only the absolutely necessary nerves. It can be stated that we have succeeded at least from a practical point of view. Because we know today that the upper abdominal viscera, hence the stomach, duodenum, gall-bladder, liver, spleen and also the upper bowel belong to the domain of the 6th-12th dorsal nerves, therefore the area of the major and minor splanchnics, so that we are able to operate painlessly on these organs with *splanchnic anæsthesia*. *The lower ileum, cæcum, ascending colon* are, on the contrary, supplied by the *lumbar segment* as well as from branches from the dorsal segment. *Härtel* assumes nevertheless that in the various intestinal divisions only the *lumbar segment* is involved and therefore the interruption of the lumbar nerves is sufficient. But this is contradicted by the fact that it is impossible to perform a colon resection painlessly by the blocking of the rami communicantes of the 1st-3rd lumbar nerves alone. The lower portion of the sigmoid



flexure and the rectum are supplied principally from the *sacral segment*, but we find according to the very exact investigations of *Frölich and Meyer* that nerve fibres which extend over the inferior mesenteric ganglion lead to the lumbar segment. The kidney itself according to *Frölich and Meyer* is supplied by the splanchnicus by way of the coeliac plexus, while *Härtel* assumes that the nerve supply to the kidney falls to the 10th dorsal up to the 2nd lumbar, therefore besides the area of the splanchnic the 1st and 2nd lumbar must also be blocked.

According to most authors, especially *Kappis* and *Härtel*, the *bilateral interruption of the nerve supply* is necessary in operations on the colon, as well as operations for appendicitis, for by this course only is an efficient anæsthesia possible, for anatomic and historic developmental reasons. This claim *contradicts my own experiments* which I have made with paravertebral conductive anæsthesia as well as splanchnic anæsthesia. It does not agree with *Payr's* experiments either. For, in a communication from *Jurasz* concerning cholecystectomy it is expressly mentioned that the interruption of the 6th dorsal to the 1st lumbar segment on the *right* side by paravertebral conductive anæsthesia completely sufficed in order to perform the operation absolutely without pain.

That the bilateral supply of the cæcum and ascending colon is not always the rule, for in many cases quite *sharply defined* areas may be discovered, was beautifully illustrated in a case of carcinoma of the hepatic flexure I saw a year ago. In this man resection of the cæcum, ascending colon and one-half of



the transverse colon was done absolutely without pain under right-sided splanchnicus anæsthesia according to the *Kappis* method and paravertebral conductive anæsthesia of the 1-4 right lumbar. The mobilization of the colon as well as the severing of the gastro-colic ligament and mesocolon was absolutely painless. Only when I traversed the middle line to the left, in the interest of a possible radical operation, the patient remarked instantly that he felt pain. By exact investigation of the sensitiveness in the mesocolon I could determine that while the clamping of the art. col. med. was painless, every attempt to clamp the anastomosis of the same with the art. col. sinist., to the left of the middle line was responded to at once with expressions of pain, so that I was obliged to inject a second time another 10 ccm. novocain solution at the root of the art. colica sins., by means of which the operation was finally completed without pain.

The anæsthesia of the peritoneum is of particular significance *in operations on the spleen* on account of co-existing adhesions of the diaphragm. *Härtel* assumes that the *diaphragm* derives its sensation from the phrenic nerve. This is contradicted by the experiences of *Braun* who by reason of his observations expresses the view that the diaphragm is supplied with sensation by the intercostal nerves, so that an interruption of them, the pleura as well as the peritoneum of the diaphragm, becomes insensitive. *The fact is therefore very important that the peritoneum of the diaphragm is supplied by the intercostals themselves and not by the rami communicantes and*



*splanchnics*. Therefore it is the splanchnic anæsthesia which makes only the united rami communicantes unable to conduct while the intercostal nerves directly concerned are not touched, the peritoneum on the inferior surface of the diaphragm is not anæsthetized, therefore an extirpation of the spleen with adhesions to the diaphragm is impossible under splanchnic anæsthesia alone. These cases can be operated under *paravertebral anæsthesia only* of the 6-12 dorsal segments, because with the injection of novocain in the vicinity of the spinal ganglion not only all the rami communicantes but also the intercostal nerves are blocked. *Kappis* also holds paravertebral conductive anæsthesia as more advantageous than splanchnic anæsthesia in extirpation of the spleen.

Very instructive is the scheme of the nerve supply of the abdominal cavity given by *Meyer* and *Gottlieb*, which on this account is here reproduced.

## VII. Methods of Anæsthetizing

In order to be able to perform an abdominal operation painlessly it is not enough to anæsthetize the abdominal walls only as is still practiced by many surgeons today, but the peritoneum of the posterior abdominal wall to which the mesentery is attached must also be desensitized. *It is therefore necessary in every major abdominal operation to,*

1. *anæsthetize the anterior belly wall,*
2. *anæsthetize the peritoneum of the posterior belly wall.* This we can accomplish either by conductive anæsthesia in the mesentery, or by means of splan-











nic anæsthesia, paravertebral or parasacral, epidural and finally lumbar anæsthesia.

#### (a) ANÆSTHESIA OF THE ABDOMINAL WALLS

Anæsthesia of the abdominal coverings was accomplished in the form of *Schleich's* infiltration anæsthesia for many years (v. *Miculicz*, v. *Hacker*, *Baker*, *Läwen*) while for the operation in the abdomen itself, when necessary, ether or ethyl chloride "rausch" were resorted to. The *Schleich* method of infiltration layer by layer, permitted the skin, fascia and peritoneum of the abdominal wall to be incised painlessly. If an abdominal retractor is introduced and traction is made, the patient naturally experiences pain because the edge of the retractor passes upon the peritoneum 2-3 finger breadths distant at a point where the anæsthetic solution cannot reach. In order to avoid this pain it becomes necessary after opening the abdomen to inject more of the anæsthetic solution into the peritoneum about a hand-breadth outward from the incision, then only can the retractors be introduced and traction made on them.

While assistant in the clinic v. *Hacker* and later in the first year as assistant in the *Hochenegg* clinic I employed the *Schleich* method, but since then I have discarded it entirely and replaced it with the novocain conductive anæsthesia. *Schleich's* method possesses the great disadvantage that it lasts hardly a half hour because it acts as an *œdema* anæsthetic in consequence of the *hypotonic* solution so that it becomes necessary to reinject the abdominal walls 2 or 3 times during an operation. For this reason I use almost



exclusively the conductive interruption of the afferent nerves by injecting novocain into all of the *layers* a handbreadth away from the incision. Only in bowel obstruction is the line of incision infiltrated with novocain, *layer by layer*, because in these cases the coverings of the abdomen are very thin. Due to the enormous distention, it is easy to plunge the needle too deep and puncture the over-distended bowel which presses upon the anterior belly wall, which is followed by instant leaking of fæces into the free peritoneal cavity.

The *median incision of the upper abdomen* is most often employed. For this incision the abdominal wall anæsthesia is made in the following manner:

A one-half per cent solution is injected *fan-shaped* into the deep tissues from three puncture points corresponding to the *lateral borders of the rectus muscle* and costal arch. First, small wheals are made with a fine needle corresponding to the six puncture points, then a medium somewhat thicker needle is inserted perpendicularly until a distinct resistance of the anterior rectus sheath is felt. This is punctured, then the needle is pushed ahead about 1 cm. until the resistance of the posterior sheath is felt. In this sheath the end branches of the intercostal nerves run to the middle line. Then under continuous injection the needle is withdrawn to the subcutaneous tissue and in an angle of 45 degrees is again advanced in a downward direction until the increased resistance of the anterior rectus sheath is felt. This is again punctured by the needle and under continuous injection is pushed forward about  $1\frac{1}{2}$ -2 cm. in width diagonally



until the resistance of the posterior rectus sheath is ascertained. While injecting novocain the needle is again withdrawn into the subcutaneous tissue. Here it is turned upward to an angle of 45 degrees and in

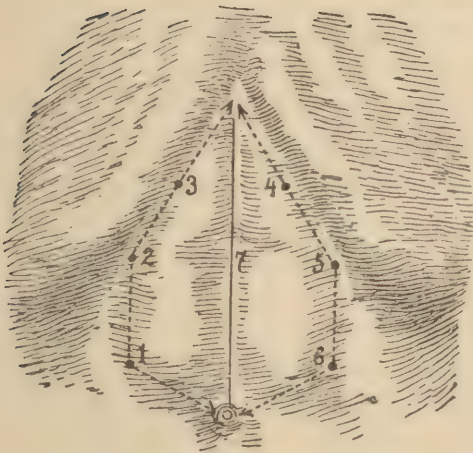


FIG. 2

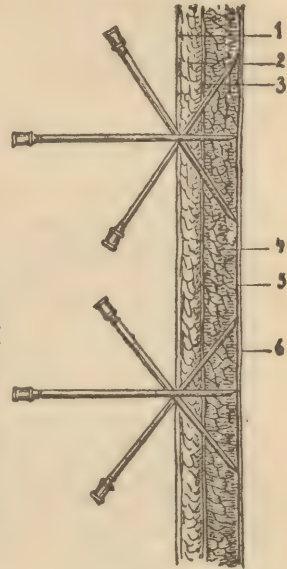


FIG. 3

FIG. 2.—Abdominal wall anæsthesia in the median upper abdominal incision. 1-6, injection points for the fan-shaped injection; 7, line of incision.

FIG. 3.—Fan-shaped deep injections. 1, skin; 2, subcutaneous tissue; 3, anterior rectus sheath; 4, rectus muscle; 5, posterior rectus sheath; 6, peritoneum.

the same manner pushed forward and injected. The same process is repeated at the 2nd and 3rd points. We term this form of injection *fan-shaped deep injection*. By the diffusion of the individual novocain deposits there exists finally an uninterrupted chammel of tissue saturated with novocain by which the nerve fibres running through them are paralyzed. The



same procedure is repeated on the opposite side. In order to make this cutaneous incision itself painless a *Hackenbrush* rhombus is placed subcutaneously, in which a long needle is pushed forward from point 1 to point 2 and upwards to the ensiform process, then finally downwards and towards the median line to the navel. The same process is repeated on the opposite side, whereby the whole skin incision is injected in the form of a rhombus. If we wait five minutes the skin incision is perfectly painless. It is therefore not absolutely necessary to inject the skin line of incision subcutaneously.

Upon opening the *peritoneum* pains are almost regularly experienced immediately above the umbilicus. This is possibly caused by the nerves of sensation running with the nerves of the suspensory ligament of the liver and have their final distribution in the navel. In order to avoid these pains the peritoneum in the neighborhood of the *umbilicus must be again infiltrated*. When the linea alba is divided very small quantities of the novocain are injected into the peritoneum. That is necessary only when the deep infiltration in the recti muscles does not reach everywhere to the posterior rectus sheath and the nerves that course through it, so that the peritoneum remains sensitive at several points.

After the peritoneum is opened, the abdominal walls are elevated with sharp hooks and *from within* on either side 10 ccm. solution is again *injected into the peritoneum* a handbreadth outward from the incision. This after-injection would not be necessary if all of the deep nerves were blocked by the fan-



shaped injection. At any rate this procedure is useful and absolutely necessary when the deep injection was imperfect. When the peritoneum has been anæsthetized in this manner through injections, then the *abdominal retractors can be introduced* and free traction exerted without pain. The application of clamps to the peritoneum is *not to be recommended* because unnecessary traction may be made and the tugging continued outward on the peritoneum that has not been anæsthetized which *naturally* must cause pain lateral to the injected areas. In correctly administered anæsthesia *relaxation of the recti muscles of the upper abdomen* usually occurs which facilitates separation of the edges of the laparotomy wound and accessibility considerably. The amount of novocain necessary for anæsthesia of the belly wall reaches 60-80 ccm.  $\frac{1}{2}$  % solution. In extreme obesity it is recommended to use a  $\frac{1}{4}$  solution, where at least a double quantity of the solution can be employed. The abdominal wall anæsthesia lasts usually for one hour at least, mostly  $1\frac{1}{2}$ -2 hours, even 3 hours at times. If the normal sensation has returned before suturing the *peritoneum* then it may become necessary to *inject another* 10 ccm. novocain into the peritoneum and posterior rectus sheath in order to be able to suture the peritoneum without pain or tension.

This new injection is certainly preferable to an "ether-rausch" because in suturing the abdominal walls a short superficial ether would be hardly enough, a *deep* narcosis would be necessary on account of the considerable tension for which an unnecessary great amount of ether must be employed. For *this reason*



*secondary injections of the abdominal walls* are preferable. The suturing of the abdomen can be much facilitated if the operator includes the peritoneum and fascia of the lower angle of the wound in one suture, places the suture and before tying it places the next high suture which the assistant crosses and thus brings the fascia layers in perfect apposition. In this manner it is possible to use comparatively finer silk for the fascia even with moderate tension.

According to *Franz's* suggestion this anæsthesia of the abdominal wall can be accomplished by blocking the *intercostal nerves* in the middle axillary line by the injection of  $\frac{1}{2}$  % novocain solution. *Franz* employs for this purpose 10 ccm. of a  $\frac{1}{2}$  % solution for every injection, so that for a single anæsthesia, e.g., in a median laparotomy, 140 ccm. solution are necessary. Now this method has the advantage that by injecting the 6th intercostal to the 1st lumbar nerve, both sides, the abdominal incision can be lengthened at will, which is important in operations for bowel obstruction; but the quantity of novocain (180 ccm.) is so great that for the deep anæsthesia more novocain can hardly be used. I have used this method very seldom because I have been so satisfied with the deep infiltration method and at the same time have injected less novocain. It may have a significant value in intestinal obstruction since by this method there is no danger of puncturing the bowel.

In the *median incision* below the umbilicus the same principle holds good of the fan-shaped deep infiltration of the outer border of the rectus muscle from three points. The skin incision is also injected in the



form of a rhombus. When the abdomen must be opened for *intestinal obstruction* the fan-shaped injection must not be made, but we infiltrate the middle line *in layers* and only after the peritoneum is opened can we inject novocain into the peritoneum and posterior sheaths of *the rectus* from within about one hand breadth outward from the line of incision. In *pararectal incision* the afferent nerves are interrupted a hand breadth outward from the incision by deep injections into the muscles down to the peritoneum. Here a unilateral injection is sufficient. The skin incision itself is injected in the form of a rhombus, on account of the anastomoses.

*With exact conductive anæsthesia of the abdominal coverings the abdominal cavity can really be entered without pain.* It would be an error if we, as it is often today, tried to operate on the abdominal viscera without further anæsthesia. At the most it is possible to perform a gastro-enterostomy or jejunostomy painlessly provided all traction on the stomach or intestines is strictly avoided. But even a simple appendectomy must cause pain even with a movable cæcum, because the clamping of the sensitive nerve fibres which run through the mesentery would elicit pain. The greater part of the narcotic can be spared if narcosis is resorted to for the intra-abdominal operation after an exact conductive anæsthesia of the belly wall. This means a great gain, for in cases when the *abdominal operation itself is to be performed in general anæsthesia, the anæsthesia of the abdominal wall could be left to an assistant to perform.* Thus more of the general narcotic can be



saved than through the preliminary morphin injections. I would consider it a *great gain* for the patient if *this combined method of anæsthesia which Lænnender recommended and designated as the method of the future and which was demanded by Lärwen also, would find, eventually, universal favor.*

(b) CONDUCTIVE ANÆSTHESIA OF THE  
MESENTERIES

In the conductive anæsthesia of the mesenteries which I practiced for more than 12 years and published in 1912 (Beiträge zur Chir., Bd. 81), a deposit of novocain of 20-40 ccm.  $\frac{1}{2}$  % solution is placed *at the base of the mesentery* with the idea of interrupting the sensory nerves which travel along the large arteries. Thus the crushing and ligating of but not the strong traction upon the mesentery become painless because the peritoneum of the posterior abdominal wall to which the mesentery is attached remains sensitive. It is evident that with this kind of anæsthesia we can operate painlessly there where the *organs are somewhat movable*, attached to long mesentery, so that strong traction during the operation is unnecessary. This applies in the *first* place to resections of the *small intestines* in which the various loops are very movable and where the root of the mesentery can be easily reached. Also the *resection of a ptotic stomach* for a small ulcer or carcinoma will be possibly painless under simple conductive anæsthesia. If on the contrary a long mesentery is not present as in the ascending or descending colon or gall bladder, then this simple anæsthesia



is not sufficient. The performance of conductive anæsthesia in the mesenteries will adapt itself differently according to the individual operations. For this reason it will be described more specifically in a separate chapter.

### (c) PARAVERTEBRAL ANÆSTHESIA

The peritoneum of the posterior abdominal wall can be made insensitive by blocking the rami communicantes which conduct pain from the abdominal organs at their exit from the spinal ganglion, with novocain. Since for a complete anæsthesia of the whole posterior belly wall at least 20 punctures are necessary from the 6th dorsal to the 3rd or 4th lumbar nerves, which is not only unpleasant and painful to the patient but also on account of the relatively great quantities of novocain which must be deposited alongside the spinal column, is not without danger, I have advised *paravertebral* anæsthesia only for *certain operations on the large bowel* which demands the infiltration of a limited number of nerves and thus only unilaterally and also in exceptional cases. I have *never* considered the *paravertebral*, the method of choice in gastric resections as *Härtel* erroneously asserted in his book on local anæsthesia, since I have been able to obtain sufficient anæsthesia in the majority of cases by infiltration of the lesser omentum. On the other hand, ether may become necessary also in paravertebral anæsthesia if one of the *rami communicantes* fails to become anæsthetized. In October, 1919, I saw in the clinic *Dollinger* a gastric resection performed by *Adam* for



a movable carcinoma, where in spite of the paravertebral anæsthesia administered by *Adam* himself by traction on the lesser omentum and ligating the same, pain was manifested by the patient so that finally ether became necessary. There is also in this procedure danger of poisoning due to the increased absorption in the vicinity of the spinal column, and as shown by experiments of *Muroyas* is very great, and in fact fatalities have occurred with paravertebral anæsthesia to which blame is laid. It is decidedly much simpler to interrupt the rami communicantes of the 6-12 dorsal nerves already united in the splanchnic major and minor, in operations in the upper abdomen by the *splanchnic* anæsthesia of *Kappis* or *Braun* than to inject every isolated ganglion with novocain.

For paravertebral anæsthesia there remain only a few *one-sided operations on the large intestine*, such as resection of the ileo-cæcum, ascending colon, eventually certain cases of appendicitis in which when the use of the slightest amount of ether as a help must be avoided, as for instance, in florid pulmonary tuberculosis. But, also for these cases I combined for the last three years the paravertebral anæsthesia of the lumbar segment with the splanchnic anæsthesia of the right side from behind since by doing this I save the injections of the 10-12 dorsal nerves, furthermore exclude the eventual combination with the splanchnic major at the same time.

For the *technique of paravertebral* anæsthesia an exact knowledge of the location of the ganglia and the rami communicantes branching out from them,



is necessary. Because paravertebral anæsthesia in the vicinity of the dorsal segments, on account of splanchnic anæsthesia, has become superfluous, it is only practiced as a rule in the *lumbar segment*. In the *sitting* posture with the upper body bent forward the ilium is marked on both sides. In the line connecting them we find the spinous process of the



FIG. 4.—Paravertebral conductive anæsthesia. a, correct; b, false position of the needle. 1, vertebral body; 2, spinal cord; 3, spinal arch and intervertebral foramen; 4, transverse process.

5th lumbar vertebra. These spinous processes are counted upward, 3 cm. distant from the middle line a 10 cm. needle is introduced at the height of spinous process of the 1. lumbar vertebra until we are about 3-5 cm. from the surface, according to the thickness of the soft parts, until the transverse process is touched which is recognized by the bony resistance. Should no resistance be felt at this distance it is proof that the needle is located in the space between



the two transverse processes. The needle must be introduced into the subcutaneous tissue and again advanced a few mm. upwards or downwards and then pushed perpendicularly into the deep tissues. Then we surely meet with bony resistance. We now touch with the needle point the upper border of the transverse process by withdrawing slightly the needle. This can be done obviously by *lowering the outer end of the needle to some extent*. Now with the needle point as near as possible to the intervertebral foramen and in order to reach the ganglion direct the *outer end* of the needle *somewhat outward* so that the needle is not parallel any more with the sagittal plan of the body but forms an angle of about  $20^\circ$  with it (Fig. 4). Now the needle is advanced  $\frac{1}{2}$  cm. over the upper edge of the transverse process, the syringe attached and aspirated in order to see whether or not the needle has struck a large vein. Then only 5 ccm. of a  $\frac{1}{2}$  per cent solution are injected.

In order to avoid unpleasant accidents it is absolutely necessary that we inject,

1. Not intravenously.
2. Not intralumbar.

The latter is possible if the needle is turned too far outward so that the needle point is advanced too far medially toward the intravertebral canal and besides if the needle is advanced more than  $\frac{1}{2}$ -1 cm. If the paravertebral anæsthesia is performed in the sitting posture then in puncturing the dural sac *liquor* escapes from the needle. In the *lateral posture*, since the needle points upward, hardly any



liquor will flow even if the needle should have entered the dural sac deep enough, unless the pressure of the dural fluid is pathologically increased so that the high level of the needle can be overcome. Surely *if liquor flows* out then we should not only withdraw the needle but should not inject at the point and avoid the *paravertebral anæsthesia* entirely because the danger of absorption is too great. Since the prolongations of the dura are corresponding to the intravertebral foramina and sometimes reach almost to the spinal ganglia there is the possibility of injuring these small processes even by strict adherence to the rules. This is in my opinion one of the reasons why *paravertebral anæsthesia is more dangerous* than the other methods of conductive anæsthesia, not only by a simultaneous injury but also by an enlargement of the surface is the possibility of absorption increased.

For the injection in the vicinity of the 2d lumbar segment, a second needle is inserted 3 cm. below the first injection point, 3 cm. lateral to the spinal column, where it touches the transverse process and while the outer end of the needle is directed downward and outward, the point of the needle inward and upward in the vicinity of the intravertebral foramen and pushed forward  $\frac{1}{2}$  cm. injection of another 5 cm. of a  $\frac{1}{2}$  % solution is made. The same process is repeated corresponding to the 3rd and 4th lumbar nerves.

In order to mobilize painlessly the hepatic flexure in *resection of the cæcum*, it is necessary to block the 10-12 dorsal nerves in the same manner by a



paravertebral injection. For the past 3 years I make the *splanchnic anæsthesia* of the right side instead of this injection, in which I inject 15 ccm. of a  $1\frac{1}{2}$  % solution in a manner to be described later. In this way, of course, a complete anæsthesia is obtained, which I have repeatedly observed is limited exactly by the middle line.

*The paravertebral anæsthesia will never be the method of choice* on account of its relative dangerousness. I pointed this out 10 years ago when I recommended this anæsthesia for certain operations and even today I stand firm on this point, to limit it as much as possible, and to combine it with the unilateral splanchnic anæsthesia in order to lessen the number of injections to the minimum.

It will be mentioned under what circumstances the paravertebral anæsthesia shall be employed as a supplement in individual major operations.

#### (d) SPLANCHNIC ANÆSTHESIA ACCORDING TO THE METHOD OF KAPPIS

The rami communicantes of the 6-12 dorsal nerves unite in the major and minor splanchnics, travel through these to the cæliac ganglion and are the transmitters of sensations for the stomach, spleen, liver and upper small intestine. It would be better instead of the complicated and uncertain paravertebral method to inject in the vicinity of the splanchnics themselves. This can be accomplished in two ways, either by injecting from *behind* according to the method proposed by *Kappis* or from in front, with the *abdomen* open, according to *Braun's* method.



The way recommended by *Wendling* to insert the needle directly through the abdominal wall and through the liver to the spinal column and inject, will not be used by anyone on account of the *great dangers*.

The *Kappis*<sup>1</sup> method which at first was accepted with great enthusiasm (*Denk, Eiselsberg*) has been more or less abandoned on account of the fatalities observed (*Khautz, Heller*). I have restricted the method considerably, employ it principally where no median laparotomy is performed, therefore where the anæsthesia cannot be made *anteriorly*. *I have experienced* no serious accident during a laparotomy with this method, but I have reduced first of all the quantity, particularly the concentration of the solution contrary to the teaching of *Kappis*. Furthermore *I never inject* with the patient in the *lateral* but always in the sitting posture which for the avoidance of complications is particularly important.

*The technique of splanchnic anæsthesia* from behind is as follows:

The patient sits with the upper portion of the body bent forward. 7 cm. outward from the middle line a 12-15 cm. long needle is introduced against the lower border of the 12th rib, then is slightly retracted the peripheral end of the needle is turned outward so that an angle of 30°-45° is formed with the sagittal plane of the body. At the same time the outer end of the needle is slightly lowered so that the needle point by advancing is pushed toward the middle line and somewhat upward until it meets the bony

<sup>1</sup> In French literature this is known as the *Nägeli* method.



resistance of the lateral surface of the 12th dorsal vertebra. The needle is then withdrawn a few cm., its outer end carried a little toward the middle line, so that the angle with the frontal plane is lessened, then the needle is pushed forward again, comes up



FIG. 5.—Splanchnic anæsthesia from behind (Kappis). 1 and 2, major and minor splanchnic nerves; 3, vena cava; 4, aorta; 5, pancreas; 6, spleen; 7, spinal cord; 8, kidneys; 9, liver. A, correct position of the needle; B, false position of the needle—lateral performed lumbar anæsthesia.

on the lateral surface of the outer body but farther forward. The body of the vertebra is touched anteriorly so long until the *bony resistance is lost*, then we are at the changing point of the lateral with the anterior surface of the vertebral body. That is the situation where the splanchnic major and minor nerves lie in the retroperitoneal tissue. If these are accidentally struck by the needle point the patient



suddenly feels a severe pain which is referred forward to the gastric region. Here the needle point remains steady, *the injection must be made* with the needle at rest because by moving the needle you run the risk during the injection of penetrating a large vein and making the injection intravenous.

Before the injection is begun it is absolutely necessary to be convinced *that the needle point does not lie in a vein*. If the injection is made in the *sitting posture*, venous blood will flow from the needle without delay even if the vein is thin. This means so much more if the vena cava has been punctured. If the injection is made on the right side while the patient is in the left lateral position, the needle stands upwards at an angle of  $45^{\circ}$ , it must therefore overcome a considerable elevation so that blood will flow spontaneously from the needle. It follows that it is *absolutely necessary* when injecting in the *lateral position* to be convinced by aspirating before injecting whether or not venous blood can be aspirated through the needle which must be attached air tight to the syringe. If this is the case, then the proof is at hand that the needle point rests in a large vein, *we must desist from injecting*. If no blood comes the injection can then be made. But even unconsciously a fatal error may occur. If the syringe filled with the novocain solution, while being attached to the needle and with the intention to press the syringe tightly upon the *needle*, *the latter* may be advanced several mm. This may suffice for the needle point which at first surely rested outside the vein to enter a vein lying close by, and now the 10 ccm. are injected



intravenously although the previous test showed positively that the needle rested outside the vein. *I am convinced that in many cases of accidental fatalities intravenous injections were made unknowingly.* These accidents can be avoided by observing the rule after the aspiration test and before attaching the syringe, to retract the needle 2-3 mm. and then to securely attach it. The anæsthesia will not suffer by this retraction, but the security of the method will be considerably increased. Now if the needle is advanced again by attaching the syringe no intravenous injection will take place. With the needle at rest 20-30 ccm. of a  $\frac{1}{2}\%$  solution are slowly injected. A second injection corresponding to the first dorsal vertebra, in which according to *Kappis* 10 ccm. more are injected, I do not make because I convinced myself by injection upon the cadaver that the solution diffuses widely in the loose retroperitoneal tissue.

The same process is repeated on the left side. It appeared to me remarkable that here more often than on the right side, a vein, frequently the vena azygos, was injured, so that venous blood came. An injury of the vena cava is naturally excluded on the left side. In all cases where on the left side blood flowed the anæsthesia was stopped naturally, obtaining an incomplete effect thereby. But on account of the *danger of a too rapid absorption*, I regard it as absolutely necessary to stop the injection.

There is no doubt that with splanchnic anæsthesia a complete painlessness can be obtained. In prolonged operations the anæsthesia ceases before the



conclusion of the operation. The *duration* of the anæsthesia depends upon the concentration and the amount of novocain solution. I have given perhaps too little novocain, but have thereby never had to blame myself for any serious accident except in a single case where in a man, 75 years old, affected with severe heart lesion, in whom a stomach resection for carcinoma had to be performed, a rapid temporary collapse occurred. Still, I could get a complete anæsthesia in very emaciated people with 50 ccm. of a  $\frac{1}{4}\%$  novocain solution. Doubtlessly danger increases with the higher concentration of the solution. Regardless of this fact an intravenous injection of 5 or 10 ccm. of a 1% solution is more dangerous than a  $\frac{1}{2}\%$  or  $\frac{1}{4}\%$ , the danger of absorption is considerably increased and I hardly believe that the proposition made by *Preiss* and *Sitter* from the Clairmont clinic for the splanchnic anæsthesia to employ concentrated novocain solution (up to 2% solution) will find many followers.

Undivided attention must be drawn to a particular danger in splanchnic anæsthesia, namely the danger of *lumbar anæsthesia performed in the lateral posture*. If the point of injection is placed more medially, say 7 cm., and if, besides, the needle is not held at an angle of  $30^\circ$ , or, at most  $45^\circ$ , but at an angle of  $60^\circ$  or more in relation to the sagittal plane, and the needle is advanced until it meets bony resistance, it may happen that the needle passes through the intervertebral foramen and reaches the dural sac laterally and eventually passes through the spinal cord and meet bony resistance on the opposite side. If the



needle is inserted and advanced *slowly* it will probably avoid passing through the cord to the bone since upon entrance of this needle into the dural sac *liquor will flow out*. I observed this accident in the first splanchnic anæsthesias, that liquor oozed out before the needle came upon bony resistance. Naturally the needle was withdrawn instantly and the splanchnic anæsthesia immediately stopped. If the anæsthesia is made in the *sitting posture liquor will always flow* unless the dural sac is partially occluded by pathological adhesions. If the injection is made in the *left lateral position* the needle stands almost *perpendicular*, pointing upward. It is clear that under those circumstances the liquor will flow only when the upper level corresponding to the length of the needle is overcome by the pressure of the liquor for which a considerable elevation is necessary. *The lateral puncture of the dural sac* does not appear to be a rarity.

It is possible naturally to cause a severe collapse and even sudden death by an injection of 20 ccm. of a 1% solution. I pointed out in the discussion of the report of *Khautz* concerning a *fatality* during splanchnic anæsthesia, that this death is best expressed by the *intralumbar injection* of novocain, if an intravenous injection can be excluded, *since with the absorption alone a death within 3 minutes is impossible to explain*. *Härtel* is of the opinion that the *relaxation of the abdominal walls* which *Denk* observed in the course of splanchnic anæsthesia could only be explained by an intralumbar injection, because in splanchnic anæsthesia the novocain absolutely does not come in contact with the spinal nerves.



*If the three most important rules are observed,*

1. to inject always in the sitting posture in order to avoid lumbar puncture,
2. to avoid *intravenous injection* by accurate test whether or not the needle does not rest in a vein, and,
3. to employ only a  $\frac{1}{2}\%$ , even a  $\frac{1}{4}\%$  *solution* according to the physical condition of the patient, then in my opinion the splanchnic anæsthesia according to the *Kappis* method is not so dangerous as is so uniformly accepted.

The reported *deaths* after splanchnic anæsthesia can be explained only by either *intralumbar* or *intravenous injection*. The supposition that at autopsy extensive *hæmotomata* should be present, is positively erroneous. If a vein is injured by the needle and the injection into the vein follows, no blood will escape from the vein as long as the needle rests within it. But even upon withdrawing the needle very little blood will flow, because in the lateral posture, especially if the pelvis is somewhat elevated, the pressure in the vein is almost *nil*, besides on account of collapse all further flow of blood will cease almost instantly even if it existed before. *I consider it therefore as directly excluded* that the post-mortem examination which mostly is performed 2 or 3 days after death because of medico-legal proceedings, is still in position to prove the certainly existing injury to the vein and intravenous injection through a *hæmotoma*.

Novocain is a poison that intravenously acts fatally



and in small quantities, but, without injury to the vein, requires a certain amount of time even in large quantities after absorption by the circulation to exert a fatal effect. Therefore in my opinion *deaths in splanchnic anæsthesia which take place within the first 5-10 minutes after the injection are always to be traced to an intravenous or intralumbar injection*, while the later fatalities, as also severe collapse observed during the operation, are to be ascribed to too *rapid absorption* of large quantities of novocain. *Heller* expressed the opinion in a fatal case observed by him that it was the acute *fall of blood pressure* resulting from the action of the novocain upon the celiac plexus. Inasmuch as in this case the death occurred suddenly after an injection on the right side, it appears to me that the explanation of *Heller* is not very plausible for we know in anterior splanchnic anæsthesia that a certain time elapses before the occurrence of the anæsthesia, therefore I hold in this case an intralumbar or intravenous injection *as much more probable* which in the lateral posture of the patient simply escaped observation.

(e) SPLANCHNIC ANÆSTHESIA THROUGH OPENED ABDOMEN ACCORDING TO BRAUN

By the anterior injection of the novocain in the open abdomen according to *Braun's* method, the serious complications which may occur by the posterior method of splanchnic anæsthesia, are much easier *avoided*. The *intralumbar* injection is absolutely impossible, the intravenous by correct technique practically *excluded*. This method possesses this *dis-*



*advantage*, however, that it can be carried out only after the abdomen is open, that by introduction of the needle the patient occasionally experiences *pain*, which under certain conditions demands a slight amount of ether. On account of the *great security* I prefer decidedly in all upper median laparotomies the anterior splanchnic anæsthesia and have never had *one serious accident* with it. Only when using a  $\frac{1}{2}\%$  solution in the usual doses of 50-70 ccm. have I observed in emaciated carcinomatous patients the occurrence of temporary dyspnœa, but the pulse was perfectly regular.

The anterior splanchnic anæsthesia is performed as follows:

After *median laparotomy* which is done under exact conductive anæsthesia of the belly wall between the ensiform and the navel, the sides of the incision are held back by means of two retractors. The left lobe of the liver is withdrawn upwards by means of a wide retractor (the long anterior vaginal speculum is best fitted for the purpose). At the same time the stomach is drawn downward with the right hand thereby stretching the small omentum. Now search with the index finger of the left hand the art. gast. sin. at its origin in the cæliac axis and go upwards with the index finger towards the head. Thereby is felt under the radial body of the index finger the pulsating aorta. Now press with the index finger the small omentum against the 12th dorsal or 1st lumbar vertebra until only the bone is felt under the finger. Under this pressure *the aorta deviates to the vena cava to the right*. Then is introduced over the index



finger a 15-20 cm. long needle against the underlying bone until we are on the bone (Fig. 6), when the needle is drawn back somewhat in order to avoid injecting the periosteum or the tense ligaments. The

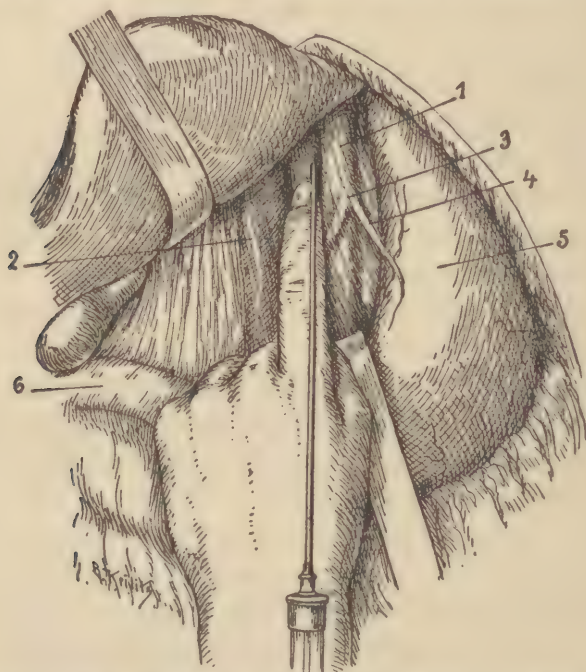


FIG. 6.—Anterior splanchnic anæsthesia (Braun). Left lobe of liver retracted upwards, stomach drawn down, through which the small omentum is stretched. 1, aorta; 2, vena cava; 3, celiac axis; 4, arteria gastrica sinistra; 5, stomach; 6, duodenum.

needle rests unchanged, must not under any circumstance be drawn back farther and again advanced, so that the vena cava is not secondarily injured and the injection made intravenously. It must now be closely observed whether *venous blood* flows from the needle. If that is not the case the syringe full



of novocain is attached to the needle and the solution is slowly injected. It is also recommended here to see by aspiration if the needle has punctured a vein. 50-70 ccm. of a  $\frac{1}{2}\%$  novocain solution are slowly injected and the needle removed. The novocain solution diffuses itself in the retroperitoneal tissues and saturates in this manner the splanchnic major and minor of both sides. Anæsthesia becomes complete after from 5 to 10 minutes and lasts according to the amount and concentration of the solution varying from  $\frac{3}{4}$  to  $1\frac{1}{2}$  hours, sometimes even two hours. At all events this anæsthesia is sufficient to render the painful mobilizing of the stomach and the ligating of the lesser omentum painless.

The technique of the injection is relatively easy and complete *failures* are extraordinarily seldom by this method. Incomplete anæsthesia is explained in this manner, that the fluid cannot diffuse itself enough on account of adhesions in the retroperitoneal space by penetrating ulcer of the stomach or on account of carcinomatous, lymphatic enlargement, so that the splanchnics are not at all or at least insufficiently reached by the active solution. Furthermore it may happen in thin people that the solution does not reach the retroperitoneal space at all, but by employing *a needle with a very long point the omental bursa* may be punctured which may escape observation, or the needle may remain outside of the small omentum so that during the injection the solution will escape which naturally would be at once observed by the operator. In order to avoid this mistake it is necessary that the *needle* has as short a point as pos-



sible, only 2-3 mm. long, that one can also introduce the needle so that its point is directed towards the head, the oblique opening of the lumen towards the pelvis. As the needle is introduced somewhat obliquely with the point towards the head, the least



FIG. 7.—Needle used in the anterior injection for splanchnic anæsthesia.

possible amount of fluid can escape through the lateral opening.

It is absolutely necessary to avoid an *injury to the large vessels*. The *aorta* can be pushed towards the left easily with the finger. The *vena cava* can on the contrary, when considerable adhesions are present in the retroperitoneal space, less easily be pushed aside so that the possibility exists of being compressed by the finger. Now, being sure of having pushed aside the vein with the needle against the body of the vertebra, we enter the compressed *vena cava*. This we will know at once, because as soon as we lessen the pressure of the finger, venous blood will flow from the needle. Should this be the case the needle must be withdrawn at once and *no further attempt at splanchnic anæsthesia* should be made, but, anæsthesia of the mesenteries can be performed. The injury to the *vena cava* is easiest avoided if the needle is not passed over the center of the index finger, by no means along the ulnar edge, but if the puncture is made *nearer to the radial edge* for the compressed *vena cava* is always found on the ulnar border, while the radial border is free. The pulsating *aorta* does



not permit of compression, it deviates. *A puncture of the vena cava does not affect the patient*, provided a needle, not too thick, is used. The formation of a demonstrable hæmatoma hardly ever occurs. In order to have the needle-point extra fine, I have had my own particular needles constructed. They are thick, so that they will not bend, but, taper down to a fine thin end, about 5 cm. long, with a perfectly flat point (see Fig. 7).

*In the formation of severe cicatrices*, as we find now and then in ulcers, penetrating into the small omentum and pancreas, it is sometimes *impossible* to separate the *aorta from the vena cava* and to place the index finger between the two direct upon the vertebra. In these cases a puncture with the needle is almost impossible. But it is unreasonable to force the injection because under such circumstances the diffusion of the solution is rendered almost impossible owing to adhesions *rendering the anæsthesia incomplete*. *Under these circumstances splanchnic anæsthesia is impossible* and must be supplanted by conductive anæsthesia in the small omentum, etc.

The procedure of *Wendling* to puncture through the unopened abdomen below the ensiform process, through the liver to the 12th dorsal vertebra and so inject the novocain, is on account of the dangers of injuries to the liver and the possibility of striking the aorta and the vena cava directly, not to be recommended.

*The quantity of novocain* necessary for splanchnic anæsthesia is approximately 50 to 70 ccms. of a  $1\frac{1}{2}\%$  solution. In very anæmic and cachectic patients,



provided I undertake the splanchnic anæsthesia at all, I make use of only 50 ccms. of a  $\frac{1}{4}\%$  solution and have obtained in this manner a complete anæsthesia even if of shorter duration. *Braun* utilizes for the splanchnic anæsthesia alone 100 ccms. of a  $\frac{1}{2}\%$  solution and has not observed any accidents in 200 cases (*Buhre*). In spite of this I have never dared to inject as much as 100 ccms. of the  $\frac{1}{2}\%$  solution, because I saw symptoms with smaller doses than 70 ccms., even in otherwise robust people, during the course of the anæsthesia, which could not be mistaken for anything else except the *toxic action* of the novocain. While in most cases, with the exception of a passing *sensation of oppression*, when the index finger touches and presses on the small omentum, no disturbances are observed, the patients are absolutely without pain and also free from unpleasant sensations, rest in comparative comfort. In some cases, 20 to 30 minutes after the injection, nausea and vomiting set in and a certain most unpleasant *sensation of oppression and air hunger*. At the same time the face is pale, pulse slower, seldom rapid. By lowering the patient's head (for the patient unpleasant, but not dangerous) these symptoms are easily and quickly overcome. Should the condition be prolonged I give *caffeine* hypodermically. The feeling of oppression will then cease, as a rule, with vomiting and thereupon the patient feels perfectly normal again. Since the patients receive during the preparation before operation pantopon 0.02 and often 0.01 morphin, it is possible that part of these symptoms are attributable to the morphin which is not prevented



by the addition of atropin. Part of it may also be caused by peritoneal irritation in consequence of the disturbances. Yet I believe that the principal part of the disturbances is due to a too rapid absorption of novocain, because I have missed these phenomena where a small quantity, say, a  $\frac{1}{4}\%$  solution of novocain is used, and besides I have practically never seen these manifestations in infiltration of the mesenteries. This is the main reason why I have never made use of 100 ccms. of the solution as *Braun* mentions even if the duration of the anæsthesia is thereby shortened. Whether the conditions can be traced to an acute cerebral anemia due to paralysis of the abdominal vessels, I do not wish to decide. At all events I have never been able to observe any special dilatation or filling of the abdominal vessels which occurred after the anastomosis of splanchnic anæsthesia.

The complete absence of pain lasts in splanchnic anæsthesia with 70 ccms. of a  $\frac{1}{2}\%$  solution usually up to  $1\frac{1}{2}$  hours. Usually in that time, even under difficult circumstances, the preparation of the duodenum and pancreas, even the ligating of the lesser omentum, have been finished. So that only the anastomosis suture is to be done. This can with the avoidance of sudden traction be performed painlessly. As a supplement we can inject 10 ccms. of novocain into the lesser omentum near the cardia. In case of resection of peptic ulcer of the jejunum where on account of an active pulmonary tuberculosis every attempt in the use of ether had to be avoided, I made first a splanchnic anæsthesia from behind according to the *Kappis* method, after this anæsthesia lost its



effect I again injected novocain from in front against the spinal column whereby the whole operation (resection of stomach and duodenum and anastomosis with the peptic ulcer *en Y* for anastomosis between stomach and jejunum and between the jejunal loops themselves) could be performed completely without pain to the conclusion.

*Splanchnic anæsthesia signifies for resection of the difficult cases of penetrating ulcer a positive advance, since here by means of a simple infiltration of the mesentery a complete painless operation cannot always be done. A question must still be decided by means of accurate clinical observations whether longer lasting intestinal atrophy should really follow in the wake of a successful splanchnic anæsthesia, as I have observed recently, but without the occurrence of a threatening condition. Should this really be the case then we must admit the superiority of the infiltration of the mesentery over the splanchnicus anæsthesia.*

#### (f) PARA-SACRAL ANÆSTHESIA.

For the organs of the small pelvis (rectum, bladder, female genitals) which derive their nerve supply from the sacral segments with *para-sacral* anæsthesia we possess a wonderful method to perform operations without pain and without danger. Operations on the bladder may be performed painlessly, as described by *Braun* under *para-sacral anæsthesia*; but *in operations on the rectum, in high up carcinoma and in the mobilization of a greater part of the sigmoid flexure, pain can still be felt.* In order to elim-



inate these pains entirely in the best possible manner I give *an additional injection of novocain in front of the 5th lumbar vertebra* and thereby block the

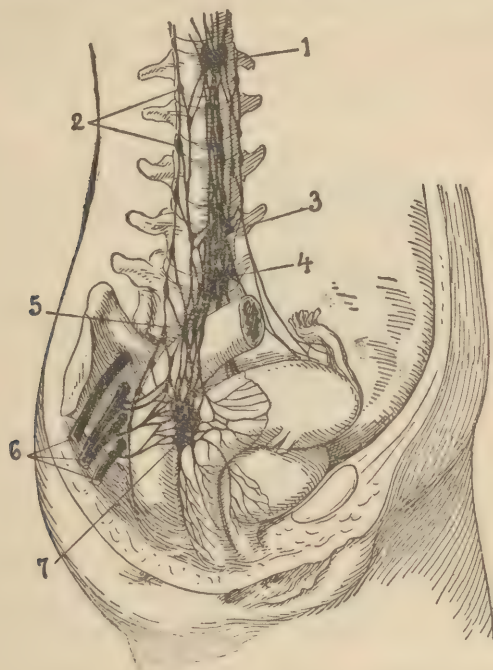


FIG. 8.—Nerve supply of the pelvic organs (Corning). 1, ganglion solare; 2, ganglion partis lumbalis trunci sympathici; 3, ganglion genitale superius et inferius; 4, plexus a. ovaric.; 5, plexus hypogastricus; 6, nerv. sacralis I-IV; 7, ganglion cervicale uteri.

sensory nerves that enter the base of the meso-sigmoid which are derived from end filaments of the splanchnic and lumbar nerves. I have pointed out the necessity of this injection in a brief communication in the *Zentralblatt f. Chir.* 1922. The innervation of the pelvic organs has become clear through



investigations made by *Frölich* and *Meyer*. Above all, I point to the scheme of *Meyer* which is shown on page 42. An anatomical representation of *Corning* (Fig. 8) is to be considered that for the rectum and the lower part of the flexure, particularly the



FIG. 9.—Parasacral anæsthesia; position of the needle in the 1st and 2nd sacral foramina.

hypogastric plexus, which lies in front of the 5th lumbar vertebra, is important.

The technique of para-sacral anæsthesia may be performed in the following manner:

In lithotomy or in the left lateral position with hips drawn up a needle 10 to 15 ccms. long is inserted laterally to the sacro-iliac joint, advanced on the anterior surface of the sacrum to the level of the 2nd sacral foramen when bony resistance is felt (Fig. 9). In order to bring the needle to the 1st sacral foramen, it has to be slightly drawn back,



then turn the outer end towards the back, so that the needle points toward the abdomen, when it can be again advanced until it touches the edge of the 1st sacral opening. Now if convinced that the needle does not rest in a vein 10 ccms. novocain solution are injected. At this point the needle is somewhat retracted and at the height of the 2nd sacral foramen 10 ccms. of the solution are again injected, corresponding to the 3rd and 4th sacral foramen. In order to avoid injecting into a vein *never* inject with the needle at *rest*. The same process is repeated on the other side, so that eventually all of the sacrum is infiltrated with 80 ccms. of a  $\frac{1}{2}\%$  solution of novocain. Now in order to block the coccygeal plexus it is necessary to surround with novocain the anterior and the posterior surfaces of the ischium and coccyx. *For operations on the bladder* (prostatectomy) the abdominal walls must be infiltrated, especially for the supra-pubic incision.

*For operation on a carcinoma of the rectum high up* besides the parasacral anæsthesia *novocain* must be injected on both sides of the transverse processes of the *5th lumbar vertebra*. Conductive anæsthesia is performed in the following manner:

In the left lateral position with flexed hip joints, the skin incision is anæsthetized by rhomboid injections. Then on both sides of the sacrum at the insertion of the ligamenta tuberosa and spinoso-sacralia and the gluteus maximus are infiltrated with a  $\frac{1}{2}\%$  novocain solution. In order to make the severing of the sacrum painless the periosteum of the dorsal surface of the sacrum is infiltrated and 3-5 ccm. of a



1½% solution is injected into the sacral canal as in epidural anæsthesia in which the needle is pushed forward into the sacral canal 2-3 cm. Then follows the parasacral anæsthesia according to the above described method. Lastly the needle is plunged into



FIG. 10.—Infiltration of the base of the mesosigma by injection at the 5th lumbar vertebra. 1, art. iliaca; 2, vena cava; 3, peritoneum of the posterior abdominal wall; 4, mesosigma; 5, sigmoid flexure (pelvic colon); 6, vertebral body.

the triangular space between the lumbar vertebra and the ilium until we strike the transverse process deep in from 5-7 cms. Now the needle point touches (after the needle is lowered and held medially) above the upper border of the transverse process in the space between this and the transverse process of the 4th lumbar vertebra and the needle is pushed 1-2 cm. farther forward (Fig. 10). In order to avoid the veins on the anterior surface of the body of the ver-



tebra, the patient is placed on the operating table in the oblique deep position of the pelvis in order to raise the pressure in the veins so that by puncturing the vein blood can spontaneously flow. Besides, previous to the injection aspiration is made with the glass syringe in order to see whether or not blood comes. If this is not the case then, with the needle at rest 10-15 ccm. of a  $1\frac{1}{2}\%$  novocain solution are injected. At the same time we convince ourselves repeatedly whether or not blood colored fluid returns. The same procedure is repeated on the second side. For a complete anæsthesia 150 to 200 ccm. of solution suffice.

(g) EPIDURAL ANÆSTHESIA (SACRAL ANÆSTHESIA)

For a lower abdominal section the *epidural anæsthesia* as employed by *Lärwen*, may be resorted to. In order to get a sufficient anæsthesia relatively large doses of novocain are required (60 ccm.,  $11\frac{1}{2}\%$  solution). Since these doses cause considerable danger to the patient, on account of the rapid absorption, the epidural anæsthesia has not received any general recognition even if individual authors such as *Kehrer*, *Schneider*, *Schlimpert* and *Schuster* have expressed themselves warmly for the employment of this form of anæsthesia.

In Prof. *Heidenhain's* clinic at Worms the *high epidural anæsthesia* is employed in gastric and gall bladder operations, according to a report of *Fischer* and *Schuster* where by means of elevation of the pelvis during the injection, the anæsthesia reaches as high as the second dorsal nerve. The injection is



made with the patient lying on the abdomen with pelvis elevated and 50 to 70 ccm., 1½% novocain are slowly injected. As it appears from the reports, *most of the failures have been recorded* particularly in upper abdominal operations. Among 60 operations on the stomach (gastroenterostomies, resections, gastrostomies) we find ten incomplete anæsthesias where eventually it became necessary to administer ether, besides eight complete failures; also in the twenty-seven operations on the bile ducts five were incomplete anæsthesias and one failure was recorded. For this reason, but more on account of the *danger of the method* (*Heidenhain* had among 630 anæsthesias two fatalities to record for which the method is held directly responsible) I do not use this method of anæsthesia in upper abdominal operations. At the most I would consider it in abdomino-sacral extirpation of a highly situated rectum carcinoma, where the relaxation of the abdominal muscles is a decided advantage during the operation.

The technique of *epidural anæsthesia* is briefly described here for the sake of completeness, although personally I have not used it during the last three years. Certain rules are pointed out however which must be carefully observed in order to avoid severe complications and fatalities. The most important requisite is that *injury to the dural sac which sometimes extends down very low must be positively avoided*. This is accomplished by being assured, after insertion of the needle in maximum *lowering of the pelvis* before the beginning of the injection, whether or not spinal fluid flows from the needle.



Furthermore we must ascertain (by aspiration with the syringe) whether the *needle has not penetrated a vein*. I perform epidural anæsthesia in the left lateral position with the legs well drawn up. Both sacral cornua bordering upon the sacral space are marked with the finger, a five to ten cm. long needle is inserted obliquely between the two against the bone. At this point the end of the needle is somewhat lowered, the needle point advanced on the anterior surface of the sacral canal for about three to four cm. The patient is then placed in the maximum deep pelvic position, left thus for a short time and carefully watched to see if a drop of spinal fluid escapes.

If no fluid escapes the patient is placed again in the horizontal position, the needle *withdrawn 2-3 mms.*, the syringe attached and the novocain solution slowly injected. The *withdrawing of the needle* is very *important* because while attaching the syringe and pushing it forward, the needle point may advance slightly and the dural sac be punctured unconsciously. Then as much as 60 ccms. of a 1½% solution is slowly injected. The quantity of the solution may be determined by the operation. For operations on the perineum and bladder smaller amounts may suffice and by lowering the pelvis the action may be increased. If an operation on the extremities is performed, then the whole quantity is needed.

Personally I have very rarely used the epidural anæsthesia but actually had very *beautiful results* with it. In this manner I was able to perform absolutely without pain the abdomino-sacral extir-



pation of the flexure in a 30-year-old officer, in the Garrison Hospital for a stenosis resulting from dysentery situated high up in the sigmoid flexure which still remained after a cæcostomy performed a year before; at the same time I mobilized the descending colon as far up as the splenic flexure. The severing of the phreno-colic ligament only was painful. In spite of this I have given up entirely epidural anæsthesia because I witnessed in a case of a young student in the Garrison Hospital No. II, during an operation for hemorrhoids under peridural anæsthesia, *a most severe collapse with cessation of respiration* very soon after the injection, which necessitated for some time the employment of artificial respiration. Although these severe symptoms were relieved, the whole condition was very alarming regardless of the minor quality of the operation. Whether or not I had to deal with an unobserved *intra-lumbar* injection or whether an exceedingly rapid absorption took place, I am not able to decide; yet, I am led to believe that the first mentioned was the cause of the trouble.

If upon the introduction of the needle *liquor flows* then it is better if the injection is not made *under any circumstances*, even if the needle is withdrawn and the liquor stops flowing. The danger of a rapid absorption is too great and a fatal outcome can hardly be avoided. In this manner a fatal case was explained which was reported by *Americh* and observed in the clinic *Peham*, where eight minutes after the injection of the usual amount of novocain profound unconsciousness and death occurred. In this



case liquor had escaped, the needle had been withdrawn, after which the injection was made.

*High epidural anæsthesia* will hardly find many followers among the surgeons because its *dangers are certainly at least as great as those of a general anæsthetic* and perhaps greater.

#### (h) LUMBAR ANÆSTHESIA

Lumbar anæsthesia must be briefly mentioned as the last method. This is actually the most central form of conductive anæsthesia. On account of its relative simplicity it has found rapid propagation. I have repeatedly used it when I was assistant in the clinic *v. Hacker*, mostly in laparotomies in the upper abdominal region, in operations upon the extremities, etc., and have observed in about 150 cases no complications with the exception of two cases of temporary paralysis of the abducens nerve. In spite of this I have not used it in laparotomies during the past ten years for the reason that the anæsthesia with small doses of tropococain is of *too short* a duration, so that later ether must be used. The method is without doubt relatively simple. All laparotomies below the navel can be performed without being obliged to anæsthetize the abdominal walls also.

By proper placing of the patient immediately after the injection the anæsthesia can be forced so high that *laparotomies* of the upper abdominal region can be done without special anæsthesia of the abdominal walls. This is made possible by a process described by *Brenner*, that immediately after an injection of 0.07 tropococain is made between the first and second



lumbar vertebræ in high pelvis elevation and at the same time the shoulders and head are raised to the maximum height, so that the *sixth dorsal vertebra* forms the lowest point of the strongly curved spinal column. After five minutes if the anæsthesia is complete the pelvis is lowered. The higher the anæsthetic is forced, the greater are the dangers of complications, principally paralysis of the abducens and paralysis of the medulla oblongata. I have never experienced such severe complications (paralysis of respiration).

In spite of this I do not employ any more the lumbar anæsthesia in laparotomies for the reason, that in major laparotomies the duration of the anæsthesia is too brief ( $\frac{3}{4}$  to 1 hour) except that very large doses of tropococain are used (0.1 to 0.15) whereby the dangers are increased and after cessation of the anæsthesia hyperæsthesia directly occurs, so that a profound narcosis becomes necessary. Since in lumbar anæsthesia a *decided lowering of the blood pressure* is apt to occur, it is also in laparotomies for bowel obstruction and peritonitis where a perfect anæsthesia of the entire abdominal cavity is so desirable that it is just as dangerous as a profound narcosis, on account of the danger of reducing the blood pressure so that at the moment of eventration a fatal collapse may occur. For this reason I prefer in these urgent cases the combination of local anæsthesia of the abdominal walls with a short, even exciting, ether-rausch at the moment of eventration, to the use of lumbar anæsthesia. The number of deaths after lumbar anæsthesia, even if not always attributable to the anæsthetic, is nevertheless so great that we cannot speak of it as a method free from danger.



## B. SPECIAL PART

In the following sections all the laparotomies that have been performed by me since 1907, from the time I was assistant in Graz, up to the end of 1922, are used as a basis. They are tabulated in a short synopsis. From this synopsis it is to be seen that among 2,408 cases, only 222 abdominal operations were done under *general anæsthesia*, 9.2% of all laparotomies. The major portion of these operations was done before 1912, after which time the operations became very infrequent under general anæsthesia.

In 2,187 cases novocain anæsthesia was used in one form or another. 1,448 cases could be operated entirely without *the aid of ether*—66.2%. In the remaining cases ether was occasionally employed even if in the majority of cases the quantity of ether used was negligible (often 10 to 30 ccm.), so that it did not once come to a temporary unconsciousness. Since I believe that in all cases where only the slightest pains are manifested ether should be administered provided there exist no stringent contra-indications. Therefore the number of operations in pure local anæsthesia is less than, for example, in the clinic *Dollinger*, where, according to the report of *Adam*, as much as 89% of all laparotomies could be performed with the use of *paravertebral anæsthesia* without the aid of narcosis. As already mentioned in



the general part of this book and will in the individual operations be more clearly shown, I have employed *paravertebral anæsthesia* on account of its relative dangerousness only in exceptional cases. Moreover in the last four years under the favorable influence of *splanchnicus anæsthesia* in which only 12% of the cases, on account of the short duration of the anæsthesia ether was required so that I am able today to perform more than 80% of all laparotomies under *local anæsthesia alone*. I wish here to expressly remark that it is not my intention to reach a high percentage of pure local anæsthesia operations, but it is solely my object *to make the results of operations as perfect as possible by the correct employment of local anæsthesia* and the most possible restriction of the amount of ether used.

To show the high value of this anæsthesia, I divide the operations into three groups:

1. *Minor* operations in which the technique of the anæsthesia is relatively simple and where a complete loss of sensation is obtained. In these cases local anæsthesia is in general use nowadays and only those surgeons who are absolute advocates of general anæsthesia still use it. To this group belong *gastrotomy, jejunostomy, ileostomy and colostomy*.

2. The second group of operations of medium severity includes those typical operations where most of the surgeons leave the choice of the anæsthesia to the patient himself and only with existing contra-indications against general narcosis advise the patient to use local anæsthesia. To this group belong *appendicitis, ventral and umbilical hernia*, operations for



the *relief of ileus* by colostomy and finally exploratory laparotomy.

3. To the third group of major operations belong those typical and atypical operations in which today the novocain anæsthesia is entirely disregarded by most of the surgeons because they represent the opinion that the performance of an operation without general narcosis is impossible, that eventually it has to be used as an aid anyhow, that it is more pleasant for the patient and less time robbing or consuming for the operator, that the operation be started at once under general anæsthesia. That this assertion is not correct, I shall prove later on.

### I. Minor Operations

In the minor abdominal operations the technique of novocain anæsthesia is relatively simple. *Exact conductive anæsthesia of the belly walls* is the principal point, the infiltration of the mesentery is usually superfluous, since no particular traction is made upon it and severing of the mesentery is not required.

I always make the gastrostomy through the left rectus in order to get a most possible continence of the fistula. In this case the unilateral conductive anæsthesia of the abdominal walls suffices. Corresponding to the left costal arch 15 ccm.  $\frac{1}{2}\%$  novocain solution are injected subcutaneously. Then from three points the muscle, down to the peritoneum, is injected with 10 ccm. novocain solution, fan-shaped, exactly the same process as in the abdominal wall anæsthesia. In order to exclude the skin anastomoses which come from the right side



TABLE I—SYNOPSIS OF THE OPERATIONS

Operation	Narcosis			Mesen. Anæst.		Parav. Anæst.		Splanchn. (Kappis)		Splanchn. (Braun)		Parav. Sac. An.		Epidural Anæst.	Lumbar Anæst.	Total
		Alone	And Ether	Alone	And Ether	Alone	And Ether	Alone	And Ether	Alone	And Ether					
Gastrostomy.....	...	24	...	...	...	...	...	...	...	...	...	...	...	...	...	24
Jejunostomy.....	...	21	...	...	...	...	...	...	...	...	...	...	...	...	...	21
Ileostomy.....	...	12	3	...	...	...	...	...	...	...	...	...	...	...	...	15
Cæcostomy.....	...	7	...	...	1	...	...	...	...	...	...	...	...	...	...	8
Colostomy.....	...	2	34	7	5	...	...	...	...	...	...	...	...	...	...	48
Radical oper. in vent. hernia.....	...	3	43	3	...	...	...	...	...	...	...	...	...	...	...	49
“ “ epigast. hernia.....	...	14	...	...	...	...	...	...	...	...	...	...	...	...	...	14
“ “ umbil. ....	...	2	22	2	...	...	...	...	...	...	...	...	...	3	...	29
Hernia funic. umbil. (Liver resection).....	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Radical oper. for App. acute.....	...	80	104	95	4	...	3	...	...	...	...	...	...	8	...	294
“ “ “ chronic.....	...	39	179	57	6	...	6	...	...	...	...	...	...	7	...	294
Exploratory Laparotomy.....	...	5	47	16	15	...	4	...	...	...	...	...	...	2	...	89
Cardia resection.....	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	3
Oesophagus resection.....	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	2
“ gastrostomy.....	...	...	...	...	...	...	...	1	2	...	...	...	...	...	...	3
Gastric resection for carc.....	...	3	82	58	...	...	7	...	40	3	...	...	...	...	...	193
“ “ ulc. vent. or duod.....	...	5	89	122	...	...	25	8	195	16	...	...	...	...	...	460
Resection of stom. and anast. (ulc. pept. jej.).....	...	1	10	...	...	...	2	3	14	10	...	...	...	...	...	40



G. E. in carc. of stomach.....	4	43	10	.....	.....	8	.....	.....	.....	65
G. E. in " " G. B.....	.....	6	.....	.....	.....	.....	.....	.....	.....	6
G. E. in ulc. vent. or duod.....	7	82	30	.....	.....	.....	.....	.....	.....	125
Gastro-Gastrostomy.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
G. E. in Perf. Ulc.....	1	2	14	.....	.....	.....	.....	.....	.....	2
Suturing over in Perf. Ulc.....	.....	.....	3	.....	.....	.....	.....	.....	.....	3
Resection in Perf. Ulc.....	.....	.....	3	.....	.....	.....	.....	.....	.....	3
Cholecystostomy.....	1	1	.....	.....	.....	.....	.....	.....	.....	2
Cholecystectomy.....	6	2	78	5	3	7	20	6	.....	127
" and Choledeochotomy.....	3	.....	14	.....	1	.....	1	10	.....	29
Oper. in carc. of G. B.....	.....	14	1	3	.....	3	2	.....	.....	23
Cholecystenteroanastomosis.....	.....	6	.....	2	.....	.....	.....	.....	.....	8
Oper. in liver injuries.....	4	2	10	.....	.....	.....	.....	.....	.....	16
" " cirrhosis.....	.....	7	.....	.....	.....	.....	.....	.....	.....	7
Splenectomy.....	1	3	11	1	.....	.....	.....	.....	.....	16
Atypical Laparotomies.....	1	6	4	3	.....	.....	.....	.....	.....	14
Oper. in bowel and peritonitis.....	10	5	23	2	.....	.....	.....	.....	.....	11
Resec. of small bowel.....	4	33	11	1	.....	.....	.....	.....	.....	51
Intestinal exclusion.....	1	5	11	11	1	2	.....	.....	.....	51
Extirpation of the excluded bowel.....	.....	.....	1	3	.....	.....	.....	.....	.....	34
Colon resection.....	2	18	44	22	3	.....	.....	.....	.....	6
Sacral op. in carc. of rectum.....	33	.....	.....	.....	.....	.....	28	6	2	89
Abdomino—sacral op. (Tunnel op.).....	.....	1	.....	2	.....	.....	.....	17	1	75
Laparotomy in disease of the female genitals.....	5	3	14	.....	.....	.....	.....	.....	.....	23
Total.....	222	919	658	86	10	59	13	293	35	2,409



over the middle line, the skin is infiltrated subcutaneously, medially from the incision, so that the anæsthesia is rhombic. If the peritoneum is still sensitive after the abdomen is opened the lateral edges of the wound may be infiltrated. The delivery of the stomach must be made very slowly and delicately because otherwise unnecessary pains will be caused. The sewing of the drainage tube in the stomach is absolutely painless, also the fixation of the stomach to the peritoneum, inasmuch as we have to deal, as a rule, with very cachectic persons in gastrostomy operations. It is hardly justifiable at this time to subject a patient to a general anæsthesia for these small operations through which the momentary prognosis of the operation naturally becomes essentially worse.

In *jejunostomy* the anæsthesia is quite similar to that of gastrostomy only the abdominal incision must be made lower down under the umbilicus so that the fan-shaped infiltration of the deep layers as well as the rhombic injection of the skin incision must be made lower. *The fan-shaped* deep infiltration should be done, whenever possible, three finger breadths away from the center of the incision. The first loop of the jejunum must be delicately searched for and especially every bit of traction upon the mesentery avoided. For the rest the jejunostomy is done as painlessly as gastrostomy. If the jejunostomy must be performed after an exploratory laparotomy for an inoperable gastric carcinoma which renders feeding through the stomach impossible, then the drainage tube is not stitched to the *lower angle of the*



*median incision* because at this point the *fistula becomes insufficient*, the fluid escapes along the drainage tube and thus nutrition becomes impossible as experience has taught me. In these cases a separate small incision is made in the middle of the *left rectus* and the drainage tube to be sewed into the coil of the jejunum is drawn through this incision. The loop is fixed to the peritoneum at the point of incision and the remainder of the incision is again sutured. In this manner the jejunostomy fistulæ remain perfectly intact and after the removal of the drainage tube they close in most cases spontaneously within a few days.

The technique of local anæsthesia in *enterostomy* is variable. If we have to deal with an *ileostomy* for total exclusion of the large intestine, for example, because of ulcerative colitis, then in a rather typical manner, as for appendectomy, the belly wall is infiltrated a hand's breadth outward from the line of incision, the skin incision injected in the form of a rhombus, here also the delicate manner in searching for the cæcum and the lowest coils of ileum proceeding from it, is absolutely necessary in order to avoid pain. If enterostomy becomes *necessary as an emergency operation in a case of bowel obstruction* which is not immediately operable, e.g., carcinoma of the descending colon, then the infiltration of the abdominal walls should be done, self-evidently layer after layer in order to avoid the puncturing of the distended intestinal coils. The lateral sides must be infiltrated from within after opening the peritoneum.

*In cæcostomy* (e.g., for dysentery) the anæsthesia



is the same as in appendectomy. In order to obtain a total exclusion of the large intestine the ascending colon must be mobilized and stitched in its whole circumference to the fistula. I perform the preparatory colostomy for the resection of a carcinoma of the rectum or lower flexure with progressive stenosis, always in the middle of the transverse colon and use for this purpose a *transverse incision* just above the umbilicus. The anæsthesia for this operation consists in the bilateral *fan-shaped deep infiltration* of the recti muscles and the rhombic subcutaneous injection of the transverse incision. The search for and delivery of the transverse colon is relatively simple and painlessly accomplished. The establishment of a fistula in the *sigmoid flexure* comes into consideration only then, when a subsequent radical operation is no longer possible, otherwise the second operation at this point becomes difficult or directly impossible on account of the fistula. The anæsthesia for this *left lateral pararectus laparotomy* is again typical: fan-shaped infiltration of the musculature down to the peritoneum, a hand's breadth outward from the line of incision, subcutaneously rhombic injection of the skin incision; after the opening of the abdomen, infiltration of the lateral surfaces of the peritoneum from within, delivery of the flexure, infiltration of the base of the meso-sigmoid with ten ccm. novocain solution, in order to permit the drawing of a tube painlessly through the mesentery for the overriding colostomy.



## II. Operations of Medium Severity

In operations of medium severity, novocain anæsthesia offers great advantages so that we should recommend the performance of the operation under novocain, in the interest of the patient. With some experience and practice we will succeed in the majority of cases to obtain a *complete anæsthesia* during the whole operation. Should a patient insist upon general anæsthesia in these cases I meet the demand in young and otherwise healthy patients by administering an ether-rausch followed by local anæsthesia of the abdominal walls or deep anæsthesia with novocain, omitting the ether entirely. Then the whole operation is performed to its conclusion under local anæsthesia. Since the patients *experience no pains* they are finally rather pleased because general anæsthesia has been discontinued.

### (1) VENTRAL HERNIÆ

The radical operation for post-operative ventral hernia demands an exact anæsthesia of the abdominal walls. If we have to deal with a hernia situated *laterally* after an operation for acute appendicitis, then the anæsthesia is just the same as in the operation for appendicitis itself under which it will be more minutely described.

In a ventral hernia situated in the middle line the abdominal walls bilaterally to the outer borders of the recti muscles must be infiltrated from three points, each fan-shaped, then the skin incision injected subcutaneously in the form of a rhombus.



In very *stout* women it is recommended to employ a  $\frac{1}{4}\%$  instead of a  $\frac{1}{2}\%$  solution, at least for the skin anæsthesia. If severe adhesions of the omentum and intestinal loops are to be separated then a brief ether-rausch must be used as an aid, under certain circumstances, for this part of the operation, while the very exact layer for layer abdominal suture can be done without ether and painlessly.

Among 49 radical operations for post-operative ventral hernia I performed 43 with novocain alone, in 3 cases a brief ether narcosis was necessary for the separation of the adhesions; 3 cases only were operated under general anæsthesia (all cases done ten years ago). The absence of post-anæsthetic vomiting has certainly a great significance for the question of relapse, because through the repeated vomiting, the recently applied suture, mostly under tension, is taxed too much.

In order to obtain *good permanent results* it is not enough in the operation for ventral hernia after opening the hernial sac and separating the adhesions to resect the hernial sac, to sew the peritoneum and to sew the cicatricial borders of the muscles and fascia in one layer. Of course, such an operation can be performed in this manner in twenty to thirty minutes, like play, but recurrence is to be expected with absolute certainty. *In all cases the cicatricial borders of the internal and external oblique muscles must be completely excised* until normal muscle tissue is apparent, then the internal oblique muscle must be separately sewed, also the fascia of the external oblique muscle, in order to increase the security by



which one can sew the borders over each other if the tension is not too great.

Five years ago I operated on a doctor for ventral hernia which developed after appendicitis operation who had been operated on twice for ventral hernia by the Professor of Surgery who had operated on him for suppurative appendicitis. In both instances the operation was done under general anæsthesia, supposedly lasting less than thirty minutes; both times, however, the hernia *returned after a few months and became larger each time*. The radical operation which I performed under local anæsthesia lasted in fact not thirty minutes, but one and one-half hours, at the same time the scar tissue was carefully removed, the extensive adhesions of the cæcum and omentum were separated, the abdominal suture made in three layers with reduplication of the fascia of the external oblique. The doctor is today, five years afterward, completely free from recurrence, although he indulges in much strenuous physical exercise (sport).

In the relatively seldom incarceration of a ventral hernia the anæsthesia is the same, only we must be particularly careful with the fan-shaped deep infiltration. Among my material there was a 125 kg. 56 year old woman who had to be operated on for incarcerated ventral hernia after appendectomy. In spite of her enormous obesity the operation was done



under local anæsthesia alone for which of course only a  $\frac{1}{4}\%$  solution was used.

## (2) EPIGASTRIC HERNIA

The radical operation for epigastric hernia requires an exact conductive anæsthesia of the abdominal wall similar to that in median laparotomy. After separation, isolation and removal of the hernial sac the peritoneum separated from the linea alba is sewed transversely, then the lower border of the linea alba is inserted under the upper edge for about three cm. and fixed or rather sutured one upon the other. By this very exact *reduplication of the fascia a recurrence is excluded*.

The incarceration of an epigastric hernia is an *extraordinarily rare* occurrence. The radical operation is performed under the same anæsthesia of the recti muscles of both sides as in the free hernia, only the infiltration in the muscle is best done after the skin incision is made.

I have seen only one case of strangulation. At the radical operation, performed under local anæsthesia, the gangrenous strangulated loop of bowel had to be resected. The hernial opening, of the thickness of a *finger*, was found three finger breadths above the umbilicus. Recovery. In another case a sausage-shaped swelling appeared suddenly in the median line in a woman 60 years of age who previously had been free from difficulties which was recognized as a strangulation hernia after complete occlusion of the bowel had occurred.



## (3) UMBILICAL HERNIA

The radical operation for umbilical hernia is performed under exact conductive anæsthesia of the belly walls, absolutely without pain, provided there exist no extensive adhesions in the opening in the hernia itself. In small hernias and lean patients the anæsthesia is very simple, by injecting subcutaneously around the hernia from four points: left, right, above

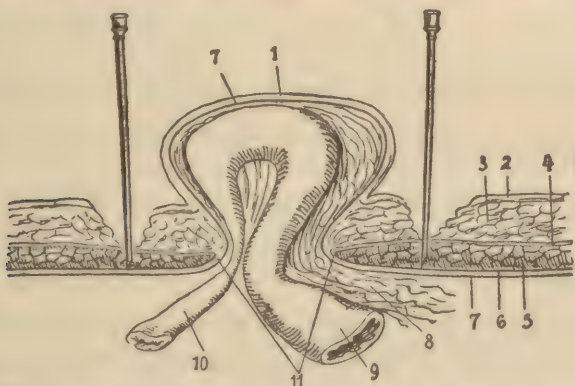


FIG. 11.—Deep anæsthesia of an incarcerated umbilical hernia from the skin incision. 1-2, skin; 3, subcutaneous tissue; 4, anterior rectus sheath; 5, muscle; 6, posterior rectus sheath; 7, peritoneum and hernial sac; 8, omentum; 9, afferent; 10, efferent loops; 11, hernial ring.

and below, in the middle line, so that a rhombus is formed.

In *stout women* with much subcutaneous adipose tissue on account of the great amount of fluid needed, instead of a  $\frac{1}{2}\%$ ,  $\frac{1}{4}\%$  novocain solution is used. Apart from this a  $\frac{1}{4}\%$  solution is injected into the skin in the line of incision. After five minutes an oval incision is made around the hernial tumor. After separation of the subcutaneous adipose tissue and ex-



posure of the fascia of the rectus muscle and with it the hernial ring, a  $\frac{1}{2}\%$  novocain solution is injected into the rectus sheath, laterally, as far as the peritoneum in a fan-shaped manner (Fig. 11) by which the conductive nerves are interrupted and the whole hernial ring with the exception of a very small area becomes anæsthetized. This corresponds to the radiating area of sensible nerves which accompany the hepatico-umbilical ligament from the deeper sutures. This point is found sometimes on the upper border, but also on the lower border of the hernial swelling. In order to render this area insensitive it is necessary, after transverse splitting and dissecting free the fascia, to infiltrate the peritoneum above and laterally from the ring. In this manner the whole hernial sac itself becomes completely desensitized. If the contents of the hernia (omentum, intestine) are entirely or only partially adherent the separation of the adhesions must be accomplished with extreme caution. By avoiding sudden traction the separation of the most extensive adhesions can be carried out painlessly.

I operate on all umbilical hernias in this manner. After transverse skin incision I incise the anterior rectus sheath to the right and to the left transversely, isolate and open the hernial sac, after the removal of the hernial sac the peritoneum is separated from the linea alba and sutured transversely. It is necessary that the peritoneum is sufficiently anæsthetized outwardly. Provided it has not already been done by deep injection it can be accomplished by infiltrating the peritoneum from within. The transverse suture of the peritoneum can now be done entirely without



pain. The fascia, rather the linea alba, is now sutured transversely by the overlapping fascia so that the lower edge is stitched to the posterior surface of the elevated upper edge three cm. away from the line of incision. Thereupon the upper edge of the fascia is made to overlap the lower edge and fixed by a row of sutures. In this manner the peritoneal suture and the old hernial ring are covered by a double layer of fascia at this point, so that a recurrence is practically excluded. In order to avoid undue tension while placing the fascial suture the patient should be placed in a half sitting posture during the entire time.

Among 25 radical operations for uncomplicated umbilical hernia two cases only were operated on in fourteen years under general anæsthesia, and one case under lumbar anæsthesia. In twenty cases local anæsthesia alone was sufficient; twice the aid of ether was necessary on account of exceptionally severe adhesions. Among the twenty operations performed under local anæsthesia alone was a child *four years of age* where only 20 ccm. of a  $\frac{1}{4}\%$  novocain solution was necessary for the anæsthesia. Because the attention of the child was sufficiently distracted by a nurse who gave the child candy, the child was absolutely quiet during the whole operation and only at the two needle punctures to the right and left manifested some pain.

To this class belongs another case, one of hernia of the umbilical cord of a new born child. In this case *infiltration anæsthesia* with *hypotonic normal salt solution* was made. There was found in this very



large umbilical cord hernia not only a large part of intestines, but also a large *lobe of the liver* which had to be resected. In spite of the seriousness of the operation, a smooth recovery took place (a. Wr. kl. W. 1914, Nr. 11, s. 283).

The prognosis of uncomplicated umbilical hernia is in itself good, even if in stout women after pro-

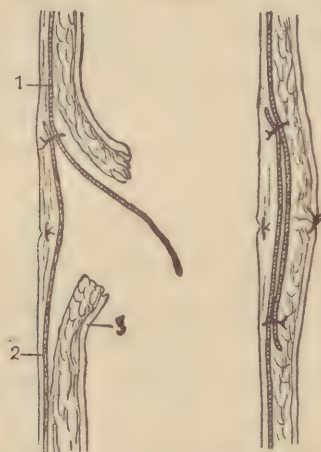


FIG. 12.—Radical operation of an umbilical hernia by fascial imbrication of Mayo. 1, peritoneum; 2, fascia; 3, skin.

longed narcosis complications of heart and lungs manifest themselves, which of course are absent under local anæsthesia. The strangulation of an umbilical hernia is judged, on the contrary, by many doctors as unfavorable, particularly when dealing with stout women. There are today many doctors who, on account of their unfortunate experience in their own patients, place the mortality of the operation of an incarcerated umbilical hernia as 30% to 50%, because these statistics are based on relatively



small figures; they possess no general value, so it is doubtless true, that even in large hospitals *the mortality after strangulated umbilical hernia is relatively large.*

Not having had a public hospital up to the present and the fact that women could not be received in the Garrison Hospital nor in the Barmherzigen Brüder Hospital, my material of emergency operations for strangulated umbilical hernia is relatively small. In ten cases an intestinal resection for gangrene was necessary six times; these cases are included in the report of small intestine resections. The anæsthesia in strangulated hernia, in principle, is the same as in the operation for uncomplicated hernia. In old and stout people a  $\frac{1}{4}\%$  solution is always employed. I have discarded *lumbar anæsthesia* which I employed during the time I was assistant in the clinic *v. Hacker* in Graz in two cases of incarcerated umbilical hernia even if the fatal results of both cases assuredly could not be laid to the anæsthesia, since one case was a stout woman, 50 years old, who died fourteen days after the operation from *pulmonary embolism*. While the second case, a woman 59 years of age, who weighed 120 kg. in whom almost the entire large and small intestines were incarcerated in the enormous hernia, died after four days from enteritis and fatty degeneration of the heart muscle, as the autopsy proved.

Among six cases in which resection of the intestine was done only one case died, a woman 68 years old, in whom suppuration of the hernial sac following intestinal gangrene and diffuse peritonitis was observed.



The remaining five cases of intestinal resection were cured, although all of them were between 60 and 78 years old. By reason of my other experiences I can express the hope that it may be possible by the systematic use of local anæsthesia to *improve* the *prognosis* of strangulated *umbilical hernia* with *intestinal resections*, *very considerably*, so that only such cases die who come too late for operation, in which even before the operation a perforation peritonitis as a result of intestinal gangrene is present.

#### (4) APPENDICITIS

Appendicitis has become an exceptionally frequent and typical operation which is performed in the smallest country hospitals and must be performed under the most urgent indications. Inasmuch as it represents a relatively simple interference of short duration it is almost immaterial in otherwise healthy and young individuals for the prognosis whether the patient is operated on under local anæsthesia or under a brief *ether narcosis*. Even in operations performed during the intervals *chloroform* or a *mixture containing chloroform* is under all circumstances to be avoided in the narcosis, not only because death may occur before or during the operation (ten years ago a young woman who was about to be operated on for appendicitis died in the Vienna Sanatorium before even the skin was incised), but also after brief operations severe *liver injuries* may arise even during an operation performed in the free intervals. Only recently *Balkenhausen* reported a case from the clinic *Tilmann* where an eleven year old, otherwise healthy



girl, died on the fourth day after an interval operation under the typical symptoms of an acute atrophy of the liver as a result of the prolonged action of the chloroform.

With a movable cæcum and a non-adherent appendix the removal of the latter is not only technically very easy and simple, but it is even possible to remove it according to the old method of *infiltration* of the abdominal covering at the point of incision without the aid of general anæsthesia, where only the clamping of the mesentery is painful, if novocain was not injected previously at its base. *The infiltration of the line of incision* makes possible a painless opening of the peritoneum, as I know from my own experience, but, where a retractor is introduced, its edge will press against the non-anæsthetized peritoneum which naturally will cause pain. If the lateral abdominal wall is drawn outward with this retractor, *the non-anæsthetized peritoneum of the iliac fossa*, between the pelvic bones and the border of the abdominal retractor, is *squeezed* and *this causes unbearable pain*, while the delivery of the cæcum is harmless in comparison. This disadvantage of the direct anæsthesia along the incision, I was able to observe personally in my own operations.

Should the *cæcum* be *fixed* to the lateral abdominal wall, either normally or through pathological adhesions, if the appendix lies laterally and is adherent, then a *deep injection* becomes an absolute necessity later to be described, into the retrocæcal tissue, in order to render the pulling upon the *cæcum* and the separation of adhesions painless, which actually suc-



ceeds. When however *the appendix* lies retro-cæcally and medially under the root of the mesentery and ileocæcum and is fixed, then this deep infiltration becomes inadequate. If we must really avoid ether, we can resort to paravertebral anæsthesia of the right side from the 10th dorsal to the 4th lumbar segment, or even better, by the unilateral splanchnic anæsthesia of *Kappis* and paravertebral anæsthesia of the lumbar segments to make the peritoneum of the posterior wall insensitive. We are never able to decide with certainty whether we have to do with simple conditions or whether to expect severe adhesions. In the cases of appendicitis that have recovered *in youth* we have not the slightest idea of the most unbelievable adhesions that sometimes occur.

Years ago I operated on a well known Viennese surgeon for an acute attack of appendicitis with perforation who suffered for many years from gastric disturbances, but who asserted positively that this was his first attack of appendicitis. At the operation there was found at the base and in the middle part of the very severely adherent appendix whose tip remained free and was at present gangrenous and perforated, that one could attribute all to a *previously* severe appendicitis. Later the patient admitted that as a child he had often suffered from abdominal colic.

When one or more severe attacks with fever and *formation of exudate* have preceded during an acute attack, severe adhesions can be expected in all prob-



ability. The position of the appendix can but very rarely be ascertained with certainty. Since with deep injection into the iliac fossa, even in the presence of extensive adhesions to the lateral abdominal wall, the aid of ether is not absolutely required. The paravertebral or splanchnic anæsthesia becomes necessary when the appendix lies towards the center, but for the patient himself is not at all pleasant. I hold, personally, to the rule, to make the *typical deep injections in every case of appendicitis*. In an adherent appendix situated medially I employ a slight amount of ether for the retrograde separation of the appendix. Only in those cases where, for example, on account of *florid pulmonary tuberculosis* every inhalation of ether should be avoided, I make at the present time the *combination of the paravertebral anæsthesia of the 1st to the 4th lumbar nerves with splanchnic anæsthesia of the right side*. The most extensively adherent appendix can be removed without the use of ether.

*The technique of the anæsthesia is therefore in every appendectomy typical:*

1. *The skin incision is injected subcutaneously in the form of a rhombus parallel to the striations of the skin about two finger breadths in front of the anterior superior spine. This is followed by deep injection into the iliac fossa, then a 15 cm. needle is inserted about 2 cm. inward and upward from the anterior superior spine until the bone of the ileum is felt. The needle is then drawn back somewhat, its outer end pointed outward and downward. By this maneuver the point of the needle is directed outward and down-*



ward. The needle is then pushed forward until it again strikes the bone. The needle is then drawn back somewhat, the peripheral end is directed farther outward by which the needle point is directed

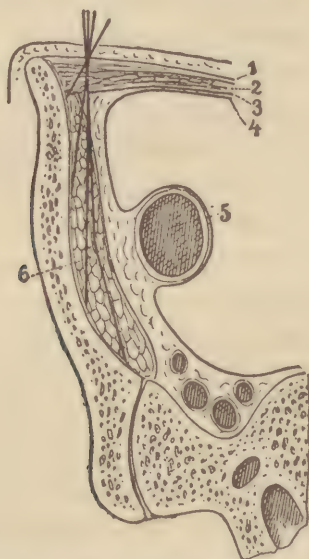


FIG. 13.—Deep injections in the iliac fossa. 1, aponeurosis of the external oblique; 2, internal oblique; 3, transverse muscle; 4, peritoneum; 5, ascending colon; 6, iliac muscle.

inward. Then the needle is again pushed forward until it again strikes the bone. Thereby the needle point goes retrocaecal in the iliac fossa behind the iliac muscle. It is impossible to reach the vicinity of the sacroiliac synchondrosis and hence *injury to the iliac artery and vein is excluded*. Now the retrocaecal space is filled with the novocain solution; in order to facilitate its diffusion through the iliac fascia, one may attempt to *stick the needle through the fascia itself*. This is accomplished as follows:



the needle is drawn back when it comes in contact just medially with the bone, the outer end of the needle is turned farther outward and then pushed directly towards the median line, but only one to two cm. corresponding to the thickness of the iliac muscle, so as not to puncture the cæcum from behind or posteriorly and thereby cause an infection of the retrocæcal tissues. About 15 to 20 ccms. of  $1\frac{1}{2}\%$  novocain solution is injected retrocæcally. That fluid can really be introduced into the retrocæcal space, can be proven by experiments on the cadaver with metheline blue or Japan black and by performing a laparotomy after injection where the diffusion of the fluid behind the cæcum is recognized by the blue or black color. In this manner I have practiced the injection technique in the course of local anæsthesia on the cadaver. The *edematous saturation of the retrocæcal space* can sometimes be proven during the laparotomy and the elevation of the cæcum. I practiced this deep anæsthesia more than ten years ago and reported it in a short paper in the *Mediz. Klinik*, 1917. S. 145. Any accidental injury, especially infection of the retrocæcal space by puncturing the cæcum, I have never been able to observe.

In order to desensitize the abdominal walls it is necessary to interrupt the afferent nerves, above all the ileo-inguinal nerve and the ileo-hypogastric nerve, a hand's breadth outward from the end of incision, therefore corresponding to the middle axillary line by deep *fan-shape infiltration of the belly walls*. If we wait five minutes the abdomen can be opened pain-



lessly. I use for this purpose the physiological incision through the belly walls, i.e., I separate the external oblique and internal oblique muscles corresponding to the direction of their fibres. For the operation, under local anæsthesia, this incision is better than the incision through the rectus sheath with

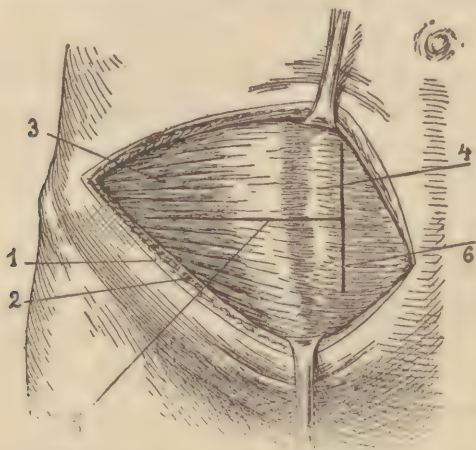


FIG. 14.—Incision through rectus sheath. 1, skin; 2, oblique external muscle separated; 3, internal oblique muscle; 4, rectus sheath.

retraction of the rectus muscle towards the median line as it is typically made in the clinic *Hochenegg*. Because in this kind of an incision, in order to deliver the cæcum, the lateral border of the incision must be retracted very strongly outward. Under local anæsthesia it is best that all severe traction be avoided. In order to obtain a sufficient access the oblique muscle is not only incised in the *direction of its fibres*, but is also incised upwards and downwards about one cm. in the rectus sheath (Fig. 14). In this manner the internal oblique can be separated



widely with retractors so that the opening of the peritoneum can be made large enough (Fig. 15). With this incision we can remove severe retrocæcal adherent appendices beautifully if the belly walls are not too thick.

The opening of the *peritoneum* is made with a perpendicular incision. It is painless to the lowest *angle*

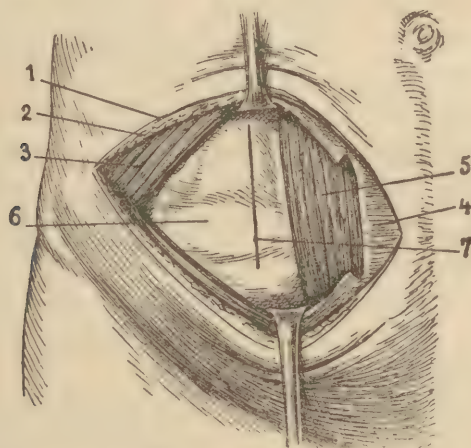


FIG. 15.—Peritoneal incision. 1, skin; 2, external oblique; 3, internal oblique and transverse muscles retracted; 4, rectus sheath; 5, rectus muscle; 6, peritoneum; 7, incision in the peritoneum.

of the *wound*. But here pains are experienced which are localized in the bladder region. These facts I have regularly observed. It is rather peculiar, because this pain conduction should be entirely eliminated by the segmentary arrangement of the lateral interruption. This fact, that the patients complain of pains in the bladder region, *makes it appear probable that the lower part of the peritoneum of the anterior abdominal wall is connected by anastomosis with the*



*sacral plexus. It is therefore necessary before opening the peritoneum in the lower angle of the wound to infiltrate separately.*

After the peritoneum is opened, the cæcum is sought for and slowly delivered. If adhesions with the lateral abdominal wall are present, these are first severed, through which the cæcum becomes mobile. It is necessary as a rule to inject novocain from the inside on the lateral side of the peritoneum. Novocain must be absolutely injected at the root of the mesentery before its division (5 to 10 ccm.). I regard this injection as absolutely necessary, otherwise pains are caused by the dividing of the mesentery which can easily be avoided. On this point I do not agree with *Braun* that the injection in the mesentery is unnecessary, that the pains caused by the severing of the mesentery can be lessened equally with morphin and scopolamin.

This form of local anæsthesia is successful in the great majority of cases of *chronic appendicitis* provided severe adhesions are not present. If no contra-indications against a general anæsthesia are present I operate in general anæsthesia if the patient expressly *demand*s it, where *chloroform* is absolutely *excluded* and only ether is employed. In order to lessen the amount of anæsthetic *the abdominal walls* are anæsthetized later in these cases. While up to 1917 among 122 interval operations, 29 cases—24% were operated on in *general anæsthesia*. I have since then essentially restricted general narcosis as is shown in Tab. 11, for among 172 interval operations, 10 cases or 5.8% were operated in general anæsthesia.



In the other twelve cases brief ether-rausch was administered mostly in frightened women and children in whom the local anæsthesia was used, whereby it was possible with 10 ccm. ether in drop doses to finish the operation in local anæsthesia with the patient wide awake, yet, believing that according to their previously expressed wishes the operation was carried out completely in general anæsthesia. In the remaining 150 cases the operation was begun under local anæsthesia—83.4%. The operation was completed without ether. In 25 cases it was necessary to use about 20 to 60 ccm. ether for the separation of the appendix. These were *severe cases* in which, according to the history, no particular adhesions were expected, but at the operation there was found a firmly adherent appendix lying towards the middle line behind the cæcum and the mesentery of the ileum. Such cases can only be operated in *paravertebral conductive anæsthesia* without the aid of ether. I employ this method only when on account of coexisting pulmonary disease (florid tuberculosis) the slightest amount of ether should be avoided. Among the 125 cases operated on in local anæsthesia exclusively the typical deep anæsthesia was carried out 113 times. In twelve cases, on account of pulmonary disease, the *paravertebral conductive anæsthesia* was made and six times typically by injection of 5 ccm. 1½% novocain solution into the 10th dorsal to the 4th lumbar nerves. In six cases a right unilateral *splanchnic anæsthesia* was made and the first to the third lumbar ganglia were also blocked. In all of these cases the operation could be accomplished painlessly with-



out the aid of ether, although in some cases severe adhesions were encountered.

Among 294 *interval operations* I had seven children under 14 years of age in whom the operation could be done in local anæsthesia exclusively, which is to be considered so much more remarkable, because there were present no co-existing diseases of the lungs, nephritis, etc. Of course, in these cases *the 1/4% solution was used which proved to be very satisfactory.* It is evident that the performance of the operation is possible only in well behaved or sensible children who do not begin to cry when brought into the operating room and placed upon the table. In restless and obstreperous children the ether-rausch must be used at least for the beginning of the operation and during its administration the conductive anæsthesia of the abdominal walls can be made in order to lessen the amount of ether to about 10 to 30 ccm. With general narcosis at least 100 ccm. of ether are necessary for a half hour's duration according to my experience in children. Also in the operation for acute appendicitis the number of operative cases in local anæsthesia has materially increased.

While up to the year 1917, the time of my article, of 110 operations during the acute attack 60 were performed in general anæsthesia—57%; the number operated on since, i.e., 184 cases, is reduced to 17 cases or 9.3% in general anæsthesia. Figuring further the 12 cases where the operation must be begun in ether and then continued in local anæsthesia whereby the patient became wide awake, it appears that with the 12 cases *the frequency of narcosis amounts*



to about 15.7%. The operation was begun in local anæsthesia in 155 cases and could be performed to the end in 92 cases—59.3% absolutely without ether. In 58 cases ether was used as an aid, yet only small quantities (10 to 40 ccm.) were employed. *In diffuse peritonitis* the cleansing of the peritoneal cavity by dry sponging or by irrigation, certainly cannot be performed painlessly under local anæsthesia without the aid of ether and with it the lumbar anæsthesia should be used additionally. The quantity of ether to be used for this purpose is insignificant even if a little more is used than in cases of chronic appendicitis, very seldom amounting to more than 100 ccm. Moreover it has a stimulating effect and raises the blood pressure. Paravertebral anæsthesia was employed four times, besides three times combined with a unilateral splanchnic anæsthesia and actually only in those cases where, on account of co-existing florid pulmonary tuberculosis, all ether was absolutely contra-indicated, which proved perfectly successful.

Among the 184 operations during the *acute attack* there were 28 children. Five of these cases were operated on in ether; seven cases were operated on in local anæsthesia exclusively without the aid of ether; one of these was a seven year old child in whom only a  $\frac{1}{8}\%$  novocain solution was employed, where in spite of the presence of a strongly adherent appendix (empyæma) the operation was made without the use of ether. In 16 cases ether was necessary, either at the beginning of the operation until the injection could be made, or while the freeing of the



appendix and cleansing of the pouch of Douglas on account of the presence of pus were being made. Here also the quantity of ether used was small, mostly from 10 to 20 ccm. The fact *that small children also may be operated on in local anæsthesia* is of special advantage during an epidemic of grip, because during this period severe attacks of appendicitis will occur as a complication of the grip, and in the differential diagnosis between grip and appendicitis the diagnosis of appendicitis is often not very easy.

We can operate after a positive diagnosis of appendicitis in spite of the co-existing lung condition; perform the operation without the restriction of uncertain conservative treatment and also in doubtful diagnosis, thereby avoiding possibly a great mishap that might occur on account of perforation.

*In the operation for chronic appendicitis* the beneficial influence of local anæsthesia cannot make itself felt, because in this operation, even under general anæsthesia, the mortality is practically nil. I have among my entire material of 294 interval operations *39 operations in narcosis with only one death*, while *in 255 cases either entirely or at least principally operated on in local anæsthesia all recovered*.

More important is the fact that the post-operative course, after these operations under local anæsthesia *is incomparably better*, so that those operated on can leave the bed on the first or second day. Severe gastro-intestinal atony, which sometimes makes an enterostomy necessary, is entirely wanting in local anæsthesia.



Local anæsthesia is of greater significance in the course of *operation for acute appendicitis*. Even if the *prognosis* here depends upon, in the first place, *the time of the operation* and the nature of the *infection*, we find that by comparison even the *severest infections* which proved fatal under operation in times past make *good recoveries* today with the same kind of operation and under the same after-care. Among my 294 cases of acute appendicitis in the first period up to 1917, 110 cases gave a mortality of 14.5%. Since that time *among 184 operations during the acute attack I have had only three deaths* 1.6% mortality.

In one of these the cause of death was pulmonary embolism which occurred on the sixth day after a radical operation for a gangrenous perforated appendicitis with pelvic peritonitis in a 34 year old officer, in whom the autopsy revealed a starting point of an embolism, an isolated *thrombosis of the left hypogastric vein* corresponding to the circumscribed peritonitis of the Douglas pouch. The intestinal function in this case was absolutely normal.

The second case was a man, 44 years old, who was operated on the 4th day after the beginning of his illness. The operation was extremely difficult because the gangrenous, completely retrocæcal appendix had perforated. Moreover a large exudate was present, high temperature from the beginning and symptoms of *sepsis* and peritonitis. Unfortunately there was no bacteriological examination made. According to the clinical course it is probable that the pelvic peritonitis was caused by *anaerobic*



agents which, as is well understood, makes the prognosis decidedly worse.

The third fatality is rather obscure. It remains questionable whether the *existing peritonitis originated in the appendix* at all. At the operation a large amount of exudate was found in the small pelvis, the peritonitic changes on the intestinal loops were as well developed as in the appendix itself; there was no gangrene or perforation of the appendix. After removal of the appendix a drain was placed in Douglas pouch; progressive peritonitis. A secondary operation for the performance of an enterostomy was refused. After five days exitus. Unfortunately in this case permission for a post-mortem examination was not granted. It appeared not excluded, according to the clinical course, that the peritonitis did not start in the appendix, but in a diverticulum of the *sigmoid flexure*, especially since the pains at the beginning and also after the operation were *most severe* at all times *on the left side*, or it may have been a mere so-called slow perforation peritonitis.

The remarkable reduction in the mortality is accounted for by the fact that the patients come to operation in the *earlier stages*. Therefore we find among the 184 patients of the last period 58 cases in which the gangrenous appendix had already *perforated* where large quantities of exudate were found in the pelvis and abdominal cavity below the transverse colon, on the contrary *only six cases of true diffuse peritonitis* where pus had spread *above the transverse colon between the liver* and the diaphragm. Between these and the first cases there lies only a



gradual difference. Most surgeons place the cases of the first kind, where the abdomen below the colon is filled with pus, in the class of diffuse peritonitis. Because I have in these 69 severe cases of appendicitis with perforation and peritonitis, when the operation was performed mostly on the third or fourth day of the illness, only three (3) deaths, that is 4.3% mortality, while during the time of general narcosis with the *Billroth* mixture and later with ether, in 34 operations for perforation and peritonitis we have twelve deaths, or a mortality of 35.3%. So the great difference, with approximately the same kind of material, I think, should be attributed to the omission of deep general narcosis.

We are aware that in acute diseases of the abdominal organs a large number of fatalities can be traced to severe hepatic derangements caused by the narcosis which are not encountered in local anæsthesia. Chloroform, and more recently ether, even in small quantities, are capable of increasing the already present intestinal atony and thereby especially in diffuse peritonitis, favor the fatal result. I can only in this way, at least partially explain to myself, why in former days out of seven cases operated under anæsthesia with *Billroth* mixture, six died of diffuse peritonitis, also why in eight cases under general narcosis four deaths occurred while among the *eleven cases of diffuse peritonitis operated on in local anæsthesia*, with the aid of small amounts of ether, in a later period only *one case died*, all the remaining cases, including two cases of pure culture of streptococci, making a good recovery.



In cases of true diffuse peritonitis following appendicitis, I am a firm believer in the thorough irrigation with salt solution, while I hold that *irrigation* with ether is harmful (formation of adhesions). *Six cases* out of *twenty-four irrigated cases died*; in *eleven cases* on the contrary that were not irrigated, *nine died*; besides these are the more favorable cases where irrigation in a few was employed because a diffuse spreading was not absolutely certain. *Payr* irrigates also where an exudate is present. Eleven out of sixteen cases were irrigated without fatality; five were not irrigated, four of which died. It is also to be considered that among my eleven irrigated cases six are included that were operated at the clinic *Hochenegg* under *Billroth* and *ether narcosis*. Since less adhesions form after irrigation, *enterostomy*, that does good service otherwise, is not absolutely necessary; in cases operated on in general narcosis it should be done on account of intestinal atony.

That it is possible to operate on apparently hopeless cases with success is proven by the following case operated on in the clinic of *v. Hacker*, in Graz:

A forty year old woman was accepted in the medical clinic on the 6th day of her acute appendicitis and on the 3rd day diffuse peritonitis. She refused operation under the impression that she would recover without it. As the woman was found moribund the next day (tracheal râles, no palpable radial pulse, absolutely unconscious) the husband and five children demanded the operation to save the mother. Since



the pulse again became somewhat palpable after intravenous saline-adrenalin infusion the operation was tried in spite of the hopelessness of the case. Anæsthesia was not necessary on account of the unconsciousness; the gangrenous and perforated appendix was removed; the great amount of exudate present was removed by copious irrigation with salt solution by means of the *Luksch* apparatus, a drain placed in the pouch of Douglas, the peritoneum sewed, the remainder of the abdominal incision left open. Saline infusion. The woman previously apathetic made defensive movements during the abdominal irrigation at the conclusion of the operation. Under steady action of stimulants, the patient recovered so that finally, after a secondary suture of the abdominal wound, she was able to leave the clinic recovered.

The great importance of narcosis especially for the course of *acute appendicitis* was expounded by *Sprengel* in an elaborate work in 1913 who urgently advised, on the basis of his experience, to avoid absolutely even the smallest quantity of *chloroform* in all operations for appendicitis. By reason of my own experience of many years with narcosis and local anæsthesia, I can repeat this advice of *Sprengel* and at the same time enlarge upon it, that in every case of severe appendicitis, but particularly in the cases of *diffuse peritonitis*, the operation itself should begin under local anæsthesia of the abdominal walls and only during the cleansing of the abdominal cavity ether should be employed in very small



*amounts.* Because according to the investigations of French authors it has been proven that the same injurious effects *upon the liver* as produced by chloroform are caused by *deep ether narcosis*, so that in existing illness the *danger of acute yellow atrophy* is increased after ether narcosis. By systematic use of local anæsthesia these complications can be avoided and the end results considerably improved. The deep injection into the iliac fossa can also be used in acute *suppuration* inasmuch as it is made far away from the inflammatory area. If in *diffuse peritonitis* all use of ether must be avoided on account of a co-existing pulmonary disease (Tbc.) then there remains only the *paravertebral anæsthesia* combined with *splanchnic anæsthesia* or the *lumbar anæsthesia*. Personally I prefer the first in these exceptional cases. The lowering of the blood pressure that often occurs in lumbar anæsthesia cannot be viewed with indifference. On the other hand the presence of acute suppuration is considered by many surgeons as a contra-indication against lumbar anæsthesia.

#### (5) EXPLORATORY LAPAROTOMIES

Exploratory laparotomy is undertaken to *establish the diagnosis*, as well as to determine the *operability* of a carcinoma. Inasmuch as it represents a relatively simple interference it is possible to be accomplished under local anæsthesia alone. Only in determining the operability of a tumor, of course, resort to a brief etherization is considered advisable, at the same time the etherization should not be made complete; also the cases for laparotomy in peritoneal



tuberculosis which possess no particular diagnostic points, but have a therapeutic indication, are included for completeness of the tabulation. Among the 89 exploratory laparotomies 47 were performed in local anæsthesia exclusively, in 16 cases an additional brief etherization was necessary. Five cases were operated in general anæsthesia before 1910. It is to be mentioned that in 15 cases of *paravertebral anæsthesia* two cases required an exploratory laparotomy to make sure whether an operation for the removal of the carcinoma of the cardiac end of the stomach were possible. During the paravertebral anæsthesia of the 6th to the 12th dorsal nerves severe symptoms of *poisoning* were manifested (small pulse, dyspnœa, even cessation of breathing for a long time) which however soon disappeared. As the symptoms began twenty minutes after the injection they are not to be attributed to an intradural or intravenous injection, but to a too rapid absorption of the novocain. In the third case the same phenomena occurred but of shorter duration. The total quantity of novocain in no case amounted to more than 150 ccm. of a  $\frac{1}{2}\%$  solution, a quantity that we use in all cases without the slightest ill results. The two cases operated on in lumbar anæsthesia were performed fourteen years ago in the clinic *v. Hacker*. In fourteen cases the *Kappis* method of splanchnic anæsthesia was made.

### III. Major Abdominal Operations

It is not possible in all cases of major operations to obtain a perfect and sufficiently lasting anæsthesia



by the injection of novocain. Yet on account of the *extraordinary improvements in the results of operations* it is obvious that by anæsthesia of the abdominal walls and deep injection, the greatest part of the general anæsthesia can be saved in case it should actually become necessary. The technique of the anæsthesia is more difficult here and delicate and careful operating is demanded not only on the part of the operator himself, but also on the part of his assistants. Although local anæsthesia in its present development serves an excellent purpose its further development is seriously looked for.

### I. OPERATIONS ON THE CARDIA

Surgery of the œsophagus and operations on the cardia have not advanced beyond the experimental stage on account of the relatively bad results obtained up to this time. This obtains primarily in *resection for cancer of the cardia*. The mortality of this operation is even today extraordinarily high because of the so-called fatalities of operation shock on the one hand, on account of the security of the suture between the œsophagus and stomach particularly after total extirpation of the stomach between the œsophagus and jejunum or duodenum on the other. The fatalities from so-called *operation shock* can be eliminated by the employment of *local anæsthesia* and this signifies a *great step forward*. I have up to this time performed three resections of the cardia with total extirpation of the stomach, but I have not experienced one fatality at the immediate conclusion of the operation in spite of the long



duration of the operation since the three cases died several days after. The best anæsthesia for this operation is the splanchnic anæsthesia either according to *Kappis*, or even better, according to *Braun*. For the anæsthesia of the abdominal wall, if the left costal arch incision is chosen, the *intercostal anæsthesia* of the 6th to the 12th intercostal nerves according to the method of *Franz* may be chosen. Because according to the investigations of *Braun* the peritoneum of the diaphragm as well as the pleura of the same are supplied by the intercostal nerves it is advisable, for making the peritoneum of the cardiac area insensitive, to perform the *paravertebral conductive anæsthesia* at least on the *left side*.

The technique of *œsophagus resection* must be still farther developed in order to obtain results that will make it possible to recommend the operation. With the uncertainty of the œsophagus suture which holds only under particular conditions the combined method (laparotomy for the mobilization of the cardia, then incision in the posterior mediastinum and finally pulling down the œsophagus from the neck) will bring results. Should it become possible to perform the large operation, or at least the greater part of it, under local anæsthesia without too great a quantity of novocain, we will be in a position to vastly improve the results. The cases of *total resection of the stomach* reported in literature up to this time, particularly in French literature, appear not to be without objection, because the French literature deals with cases of subtotal resections in which a small part of the fundus covered with peritoneum was utilized for the anastomosis.



I have tried *resection of intrathoracic œsophagus carcinoma* in two cases. Splanchnic anæsthesia according to the *Braun* method did very good service in the mobilization of the cardia, separation from the stomach, the closing of the stomach, as well as the suturing of the diaphragm.

The 58 year old man stood the operation splendidly at first, but, there occurred necrosis of the œsophagus which passed through the posterior mediastinum, followed by suppuration and after cutting through of the diaphragm suture, fatal peritonitis. The second case which we intended to operate on according to the method of *Kümmell* was actually inoperable since the carcinoma was situated at the bifurcation of the trachea pleura had invaded both pleura and in consequence during the dissection a bilateral pneumothorax occurred and death ensued.

In the treatment of *cardiospasm splanchnic anæsthesia* gives excellent service. The operation of *Heller* (longitudinal splitting of the hypertrophic musculature of the cardia) may be performed with this anæsthesia exclusively. According to the method of *Heyrovsky* also the placing of a wide anastomosis between the fundus of the stomach and the dilated œsophagus is possible under pure local anæsthesia. I have performed this operation three times. In the first case, splanchnic anæsthesia was made according to *Kappis* with a  $\frac{1}{2}\%$  novocain solution.



The anæsthesia was excellent for two hours when the sensitiveness returned so that at the end of the anastomosis suture a little ether was administered. The abdominal suture itself was possible without any further narcosis because the abdominal walls were again injected with novocain. In the second case the entire operation was done completely without ether. Because I had to deal with a very cachectic woman of 36 kg. I used instead of a  $\frac{1}{2}\%$  solution for the splanchnic anæsthesia, a  $\frac{1}{4}\%$  and only 59 ccm. so that for the complete operation in splanchnic anæsthesia plus abdominal wall anæsthesia, there was employed not quite 150 ccm. of a  $\frac{1}{4}\%$  solution. The anastomosis between the stomach and œsophagus could be done with ease in a width of 6 cm. on account of a co-existing ptosis of the stomach. The whole operation lasted  $1\frac{1}{2}\%$  hours and the anæsthesia was sufficient. In the third case the anæsthesia was also excellent. The whole operation was done to the end without ether.

## (2) GASTRIC RESECTION

### (a) *General Consideration of Anæsthesia and Technique of Stomach Resections*

Resection of the stomach has become during the last ten years one of the *most frequent of laparotomies*, not only in the hands of individual surgeons, but in the surgical departments of large hospitals, on account of the increasing successes. To most surgeons *general narcosis is the method of choice* for this operation since local anæsthesia is still con-



sidered totally insufficient. During a debate on local anæsthesia and general narcosis, in the Association of Viennese Surgeons and in the 1921 Congress of Surgeons, prominent operators expressed opinions *against the employment* of local anæsthesia in major abdominal operations. When we speak to the *surgeons* from the small *country hospitals* about this important question, the fact is always brought forward that since the introduction of local anæsthesia, with which though they are not able to get along very well yet, the results of their operations have become much better, although they are not as rigorous in the choice of cases now as at the time of the use of general anæsthesia. *On account of my somewhat extensive experience I have become a convinced disciple of local anæsthesia, particularly in major operations*, because I must attribute to it truly extraordinary favorable results. Since I am convinced that in gastric as well as in intestinal resection the value of local anæsthesia must find, although slowly, more general recognition, so as to achieve this object *the most important chapter in abdominal surgery, namely, gastric resection is discussed in detail here.*

For gastric resection various methods of anæsthesia are at our disposal. To all of these methods accurate *conductive anæsthesia of the abdominal walls is universal*. It must be especially mentioned however that it alone does *not* suffice for a gastric resection. Hence surgeons who use this anæsthesia alone and do not bother themselves about the sensibility of the mesentery are bound to meet with failures. Only in this way can it be explained how



otherwise serious minded surgeons of reputation still assert that on the basis of their own experience it is simply impossible to perform a difficult resection under local anæsthesia painlessly, that one must later use in addition general narcosis, and that reports about painless resection performed under local anæsthesia are lacking in truth. I am convinced that if these surgeons would only take the trouble to convince themselves by personal observation that complete anæsthesia is done by many practicing physicians and foreign surgeons who formerly were objectors and have become strong advocates of the method and how these same surgeons have themselves succeeded in making a perfect anæsthesia, even an anæsthesia of the mesenteries, particularly a splanchnic anæsthesia and then operated, they would soon change their opinion that a *painless resection in local anæsthesia* is impossible.

It is a matter of experience that old and *severely cachectic* patients with carcinoma of the stomach *are much less sensitive* than patients with penetrating ulcers for which reason even in general anæsthesia much less narcotic is used with them than in cases of ulcer. The advantages gained by the use of a reduced quantity of narcotic becomes illusory if we consider the fact that in cachectic patients the small quantity of narcotic may cause irreparable damage. The fact that carcinoma patients are less sensitive can be proven also by local anæsthesia of the abdominal walls and doubtless it is possible in exceptional cases to succeed with simple infiltration anæsthesia according to *Schleich's* method, provided a sufficient



amount of morphin (0.015—0.03) has previously been administered. This we find in the material at the clinic of *v. Mikulicz*, yet it will never be possible to resect a large ulcer penetrating into the pancreas with infiltration anæsthesia of the abdominal wall alone, in spite of the simultaneous action of the morphin.

Besides the anæsthesia the technique of the resection is the deciding factor for the success of the operation. As the method of choice that procedure is the more valuable which offers the best guarantee in any of the radical operations that the sutures will hold fast, and produces an instantaneous undisturbed function of the anastomosis as well as the best permanent results obtainable. The last point is as yet hard to decide, because not enough time for the observation of the individual methods of resection and their modifications has elapsed to allow us to pass final judgment.

For the union of stomach and bowel after anastomosis the two *classical methods* according to *Billroth No. 1* and *Billroth No. 2* are at our disposal in their original form. If they are not practiced today in the manner used by *Billroth* and his pupils the reason is that both methods in the original form possess essential disadvantages through which the dangers of the operation are increased and the results made worse.

The original method as practiced by *Billroth* of the direct union of the duodenum with the stomach, i.e., the *Billroth No. 1* has the great advantage that it restores the natural relations and that it does not



*exclude permanently the duodenum.* According to *Borodenko* the permanent exclusion of the duodenum is supposed to lead to functional disturbances of the pancreas and eventually to atrophy. *Kasper* attributes the difficulties which he observed after the unilateral exclusion of the pylorus according to the method of *v. Eiselberg* for ulcer of the duodenum directly to injuries to the pancreas. This is such an *important* point that, if it is possible to verify it by further clinical observations, we are absolutely *obliged in all cases* wherever possible to insist upon the *direct union* of the stomach stump and the duodenum in the form of *Billroth No. 1* even after consideration of the greater dangers and greater mortality, just as *Haberer* advised and also practiced recently. The greatest disadvantage of the *Billroth No. 1* method is the uncertainty of the *suture line* even with the most exact technique. If the suture can really be applied without any tension in small resections, if the *lumen* of the duodenum is *wide enough* to obviate the occurrence of a permanent stenosis after the knot is tied, then the method can and will give good immediate results. If however the *slightest tension exists* then it depends above all on the *regenerative ability* of the individual whether at the time of cutting the sutures (on the 5th or 6th day) the agglutination of the serosa has advanced far enough to withstand the separation of the sutures. A diffuse peritonitis need by no means occur in spite of the dehiscence of the knot since by simultaneous agglutination of neighboring organs the shutting off of the free peritoneal cavity follows, even if an in-



terruption of the passage and peristalsis persists. This severe *disturbance of function* alone is apt to lead to death eventually.

Two years ago I experienced such a late fatality after a resection of a peptic ulcer of the jejunum after gastroenterostomy. After the direct union of the stump of the stomach with the duodenum, for two weeks no symptoms on the part of the stomach existed. But after that period signs of obstruction with increased vomiting suddenly manifested themselves. At the autopsy a *dehiscence*, covered by the neighboring organs (pancreas, omentum, liver), was discovered at the point of anastomosis. This dehiscence was due less to the tension of the sutures (which was entirely absent at the operation) than much more to the extraordinary lack of resistance of the very much emaciated patient. Together with the re-formation of adhesions to the ascending portion of the duodenum, there occurred through this dehiscence a clinical picture of renewed duodenal stenosis.

If in resection of ulcer of the duodenum the direct line of suture is accomplished under such great tension that an assistant has difficulty in keeping the stump of the stomach and the duodenum in apposition, then it must be considered fortunate if in these cases no suture insufficiency arises and the stitches heal smoothly, as *Nowak* observed in thirty-four cases operated on by the *Billroth No. 1* method, al-



though here the suturing was done under very great tension as I know from personal information.

*We do not need to fear the dangerous angle at the junction of the three sutures* (anterior and posterior anastomosis suture and stomach closure suture) because this point can be done not only by double sutures which fasten the anterior and posterior surface of the stomach and upper duodenal wall simultaneously, but also by stitching the remaining portion of the hepato-duodenal ligament together and gives more security. I see no advantage in the modification practiced by *Kocher* in which the anastomosis, by being placed more towards the center, causes the tension to become still greater.

The relations in the *descending portion* of the duodenum are the deciding factors for the permanent results of the *Billroth No. 1* method according to my opinion. If, as is frequently the case in duodenal ulcer, the descending portion of the duodenum has to be separated from the severe adhesions with the gall bladder, then the reforming of adhesions cannot be avoided even after thorough peritonealization. If they occur again they may cause new symptoms of obstruction and finally a recurrence of gastric ulcer in the stomach or at the point of anastomosis. Personally I have used the *Billroth No. 1* method in exceptional cases only. Nevertheless I have four patients among my forty-seven operated cases as far as their *fate* is known to me who complain of frequent gastric *disturbances* where X-Ray examination demonstrates *deficient emptying power* of the stomach. In one case a *second operation* had to be done



on account of a *residue in the duodenum*, in which the typical anastomosis, later to be described, was made for the *exclusion* of an ulcer situated at the papilla. The patient has been free from complaint ever since and has gained considerably in weight. *v. Eiselsberg* also mentions that secondary changes were observed in several cases which were operated on by the *Billroth No. 1* method. One case had to be operated on again and for this reason the *Billroth No. 1* method was again discarded in the clinic.

The disadvantage of a *secondary stenosis* following the *Billroth No. 1* method can be avoided by the *modification* recently proposed by *Haberer*. Apart from the greater security of the suture, the chief value of this modification is that perhaps it will give the same good results as I have obtained with the typical end to side anastomosis between the stomach and jejunum. *Haberer* closes the duodenum by suture and plants the *whole of the transverse incision* in the stomach end to side in the descending portion of the duodenum. He reported twenty-one cases operated on in this manner. The method is well explained in the accompanying illustration. I have made use of this method which *Haberer* designates as *termino-lateral anastomosis between the transverse incision in the stomach and duodenum* in seven cases because of its unquestionable advantage over the original method of *Billroth*. Yet I have *never* implanted the entire transverse incision into the duodenum which was impossible on account of the oblique resection with almost the entire removal of the *whole* lesser curvature, the incision in the stomach being



15 cm. wide and more, while the mobilized part of the descending duodenum is *never* over 10 cm. long. For this reason I have sutured the *upper part of the stomach* incision in all cases and only at the greater curvature with an opening of three fingerbreadths, performed the anastomosis with the duodenum by a three layer suture (Fig. 16, right). At the point where the anastomosis suture meets the suture line of the closure of the stomach the suture point can

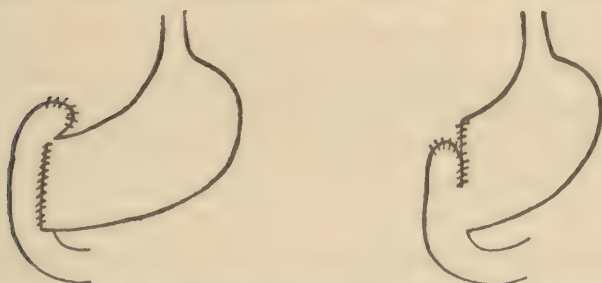


FIG. 16.—End to side gastro-duodenostomy (*Haberer's method*).

be made secure by sewing the anterior and posterior walls of the stomach to the duodenal wall in two places by which a wide portion of the duodenum is placed over the angle, alongside of which the remains of the lig. hepat. duod. can be sewed over this point. I have never applied a clamp to the duodenum during the anastomosis suture, but after carefully packing off the abdominal cavity I have sutured with the open lumen; in this manner the asepsis is as well guaranteed as by the employment of the clamps.

I have used *Haberer's* modification in suitable cases because its advantage is obvious. I was *not*



induced to do so because of poor experience with my own end to side method of anastomosis between the stomach and jejunum, or to return to *Billroth No. 1* method, which in the original form in several instances gave me even worse functional results than in the typical end to side anastomosis. I must mention in particular that I do not know of one individual case during a long period of observation (5 to 10 years) by which permanent damage to the pancreas could be observed as mentioned by *Borodenko*. I have never observed a peptic ulcer of the jejunum in all of my 236 resections for duodenal ulcer (the resections for gastric ulcer have up to this time not all been fully controlled) not even in those few cases where, instead of the extensive resection of the stomach (at least  $\frac{1}{2}$  to  $\frac{2}{3}$  of the stomach) only the antrum (therefore  $\frac{1}{3}$  of the stomach) had been removed. On account of the *brilliant permanent results* with the extensive resection and typical end to side anastomosis between the jejunum and stomach I can only make up my mind with difficulty, in spite of theoretical reasons, to give up entirely the practice of the anastomosis formation in favor of the *Billroth No. 1* or its modifications. Only many years observation can decide whether the permanent results are better by direct implantation of the stomach into the duodenum, according to *Haberer's* view of terminolateral anastomosis, than the end to side anastomosis between the stomach and jejunum, which is much easier to perform and is less dangerous than the modification method of *Billroth No. 1*, and therefore gives better immediate results.



In cancer of the stomach I have never used the *Billroth No. 1* method or its modifications because I extend the resection always as far as the œsophagus, neither in those cases where the duodenum is sufficiently movable.

It appears to me that in carcinoma with very reduced *regenerative power* the method of *Billroth* is particularly dangerous *if there exists the least amount of tension*, since by cutting through of the sutures *the peritoneal agglutination* is not sufficient, so that even without tension during the operation dehiscence may yet occur. In making the anastomosis we must always consider that by changing the position of the patient a certain amount of tension may arise, also that by the *physiological movements* of the stomach a certain amount of *pulling* is exerted at the point of anastomosis which is entirely wanting in gastro-jejunosomy where the jejunal loop is freely movable and follows the stomach motion. Another disadvantage of the direct implantation of the duodenum is, if a *recurrence* should take place in the pancreas or in the regional glands in spite of thorough extirpation, this recurrence extends over the point of anastomosis between the duodenum and stomach and causes a *stenosis*. In sub-total resection with end to side anastomosis with the jejunum the anastomosis lies in the left hypochondrium far away from the point of recurrence.

The *Billroth No. 2* method possesses the great *advantage* that, even with extensive resection of the stomach, the anastomosis suture can be applied *without the least tension*. *Much more of the stomach can*



be removed than by the *Billroth No. 1* method. This was the reason why the *Billroth No. 2* method found more favor, especially in resections for carcinoma. The method has however several great *disadvantages*. *Suture insufficiency* will occur at times at the closed *duodenal* stump thereby causing a diffuse peritonitis or at least the formation of a *duodenal fistula*. This insufficiency may be traced to two sources:

1. Insufficient care of the *duodenal* stump, either due to poorly applied sutures or to disturbances of circulation which may cause partial necrosis.

2. The more important cause lies in the filling of the afferent jejunal loop, a backing up in the *duodenum* whereby the closing suture ruptures. This backing up is favored by the use of the *long loop* (50 cm.) for the anastomosis as was done in the earlier days and is still done by many surgeons and placed in front of the colon, for anterior gastro-enterostomy. By the use of *posterior* gastro-enterostomy with short loop *this retrograde filling* of the *duodenum* is more easily avoided, also by an entero-anastomosis simultaneous with the anterior gastro-enterostomy so that by exact suturing of the *duodenal* stump, the giving way of the ligatures is less to be feared.

If the resection of the lesser curvature reaches to the *œsophagus* a small remnant of the stomach which appears like intestine remains. If the incision in the stomach is closed completely, according to the *Billroth No. 2* method there is found hardly place enough for the application of the posterior gastro-enterostomy. This comes in proximity with the



turned in closure suture of the stomach whose prominent inner projection may come to lie in front of the anastomosis or may there become directly invaginated whereby a *temporary or permanent occlusion of the anastomosis* may be caused by the *inverted closure of the stomach*. A case was operated on by *Heyrovsky* in the clinic *Hochenegg*, in January, 1911, that died on the 16th day after the operation from repeated vomiting. At autopsy the inverted portion of the stomach closing suture line was found in the anastomosis opening making a complete occlusion of the stomach (Wr. klin. W. 1911, S. 258). A similar observation was made by *Martin* (Köln).

The fatality which I experienced with *Heyrovsky* at the clinic *Hochenegg* induced me in September, 1911, in an extensive resection of the stomach for carcinoma, to perform the *end to side anastomosis between the gastric stump and the first jejunal loop* instead of the typical *Billroth No. 2* method which had been practiced up to that time. Here the whole transverse incision was not utilized as as had shortly before been recommended by *Polya*, but the wound in the stomach was closed in its upper portion and the first jejunal loop was anastomosed with the lower portion of it. The post-operative course was so good in this and in the cases that followed which were all operated on in local anæsthesia that I have used this method of anastomosis exclusively ever since.

Because the *second method of Billroth* and its modifications which were recommended and illustrated by *Krönlein-Mikulicz* appear in the text books



and also in the Hand Book of Surgery by *Bergmann-Mikulicz*. Naturally only this method and the latest communication from *Polya* were known to me. Other surgeons, too, with whom I discussed this subject minutely, for instance, *Brenner* in Linz whose great services in gastric surgery are well known, were acquainted with this method of anastomosis, but not with the procedure of *Hofmeister* practiced since 1908 which is identical with the method as practiced by me.

It is in my opinion quite indifferent what *name* this method is to be known by, but it is reasonable to *demand that with the name one is able to draw a correct mental picture and furthermore to be able to execute the method exactly*. In Vienna, since the year 1914, the method of the lateral implantation of the gastric stump into the jejunum, as I have described, is generally practiced but is known mostly as the *Krönlein-Mikulicz*. That is not correct because it leads to error. The country surgeon who reads in the Wiener Klin. Wochenschrift about the good results obtained with the *Krönlein-Mikulicz* method will naturally refer to a text book of surgery or any other reference book and instead of doing the *Billroth No. 2* method as he had learned, will practice the method *Krönlein-Mikulicz* as described and illustrated. Naturally he will not be able to achieve the good results as recorded in the reports of the meeting, but like many other surgeons before him, among others *v. Mikulicz*, will experience *duodenal fistula* and *suture insufficiency in the anastomosis* which he will erroneously ascribe to faulty technique, because



he cannot know that a method is practiced by the Vienna surgeons which has to do with a method altogether different and does not possess the disadvantages of the actual method practiced by *Mikulicz* himself.

The method of *Krönlein-Mikulicz*, as illustrated in the Hand Book of Surgery, should be designated

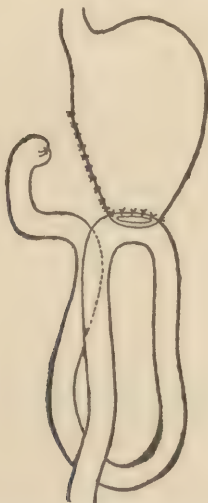


FIG. 17.—Anastomosis according to *Mikulicz*, generally designated as the "*Krönlein-Mikulicz*" method.

actually as the method of *v. Mikulicz*. *Narrath* also emphasizes the fact that *there is no such method as Krönlein-Mikulicz*. *Krönlein*, as may be learned from his own short communication, implanted the *entire stomach incision*, which happened to be rather narrow, into the jejunum in the only case which he operated on *similar to this*, and implanted the jejunal loop not from *left to right*, but in the *reverse direction*. According to the method of *v. Mikulicz* a loop



of jejunum about 150 cm. long is implanted in the lower edge of the stomach incision which is severed transversely (see illustration) and from the left to the right side. The anastomosis in this position of the loop is only possible after the lower end of the stomach is severed transversely at the greater curvature, but, with the method now *mostly used*, which

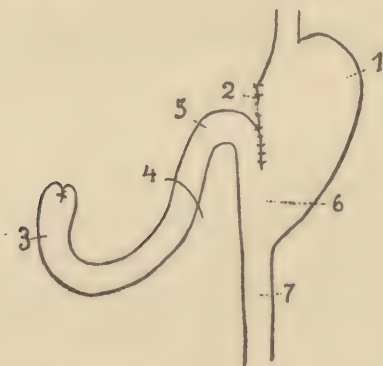


FIG. 18.—“Typical” anastomosis (gastro-jejunostomia retrocolica oralis inferior).

also carries the name *Krönlein-Mikulicz*, the loop is placed from above downward upon the transverse stomach incision and anastomosis is made after the partial closure of the stomach wound. *This according to my opinion is the chief difference between the method of v. Mikulicz and the modification practiced and defended by Hofmeister and myself.* Because this application of the intestinal loop is of *greater consequence* for the good functioning of the anastomosis later on and for the security of the suture, I am unable to join *Haberer* in his view that in this method we have only an inferior meaningless modi-



fication. If, by the improvement of a method, we are enabled to avoid *deaths, severe complications* (duodenal fistula resulting from giving way of the duodenal stump) it possesses for the patient, in my opinion, a very decided value.

As the result of the long loop and the retrograde filling there occurs in the method of *Krönlein-Mikulicz* a bursting of the *duodenal stump*. Because the descending loop cannot be sutured high enough without provoking thereby the direct filling of the ascending loop, there is danger at the angle where the three sutures meet (the anterior and posterior anastomosis suture and the stomach closing suture) of *suture insufficiency*. This disadvantage was evidently the reason why this modification was not always used by *v. Mikulicz* and when a special differentiation was made between this and the *Billroth No. 2* method. We learn from the particular studies of *Makkas* concerning carcinoma of the stomach at the clinic of *v. Mikulicz* that 80 cases were operated on according to the *Billroth No. 1* method and 81 cases according to the *Billroth No. 2* method, i.e., according to the *Krönlein-Mikulicz* method.

From these reports it becomes evident that the modification practiced by *v. Mikulicz* in some cases, did not give such *decidedly better results* as did the *Billroth No. 2* method, so that this modification can be rather described as a less important deviation than the usual method now in practice. This explains why *v. Mikulicz* did not regard it separately from the *Billroth No. 2*. The method used by *Krönlein* in one single case is so *basically different* from the



procedure practiced by *v. Mikulicz*, that it is actually impossible to combine the same in one common method. The illustration by *Krönlein* made ten years after the operation was shown at the Congress of Surgeons in 1898. In this case the *entire* transverse incision of the stomach was implanted into the jejunal loop running from left to right (Fig. 19). When one compares the two illustrations of the

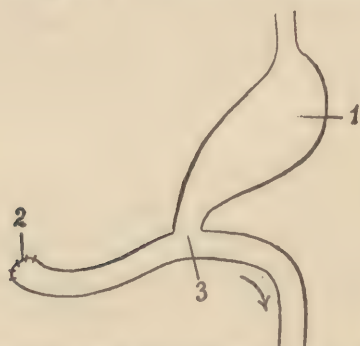


FIG. 19.—*Krönlein's* method of anastomosis. 1, stomach; 2, blind closed duodenum; 3, anastomosis with the whole transverse gastric incision.

*Krönlein* method and the *v. Mikulicz* with each other, the difference can be readily recognized. The drawing made by *Krönlein* himself of his method is quite different from the drawing which was made by *Payr* and *Hohlbaum* and is contained in the text book of *Kraus* and *Brugsch* under gastric carcinoma.

The case operated on by *Krönlein* in 1887 was that of a 24-year-old man in whom a cicatricial pyloric stenosis was present, in whom there could be seen after the resection of the cicatricial degenerative pars-pylorica "that the



duodenal transverse incision had an opening only large enough for a fine probe to pass. To resect a larger piece of the duodenum was impossible on account of the existing conditions, so the operator decided to close the duodenal end first by sutures, then to insert the lumen of the stomach incision into a loop of the jejunum." The patient died 24 hours after the operation. At the autopsy it was found that the *gastro-intestinal union did not functionate properly*. The jejunal loop *was kinked in an acute angle at the suture line, the small intestine above it was markedly dilated*, below it, collapsed. The stomach was visibly dilated.

When we inspect the drawing which *Krönlein* produced, ten years after the operation, *the filling of the afferent loop* in this form of apposition is very easily explained. Even according to the drawing, the afferent loop is on a level with the efferent loop, even somewhat lower, besides rather in the direction of peristalsis. Should the stomach be slightly turned, which usually happens after the division of its normal fixation to the duodenum, then the descending left-sided loop comes into a much higher position than the ascending loop and *the filling of the afferent loop* with its dangerous results is *unavoidable*. The acute angled kinking of the loop mentioned in the post-mortem record, by which the evacuation was prevented and the dilatation of the stomach caused by this backing up, is difficult to understand by studying the illustration made by *Krönlein*, but would



be easily explained if the loop was pictured as shown in the *Hand Book of Surgery*, according to the *Krönlein-Mikulicz* method as from left to right. Whether this connection was actually made or whether after ten years *Krönlein* erred in the representation of the drawing, remains an open question.

*Krönlein* personally does not seem to have reported this method of resection of the stomach as men-

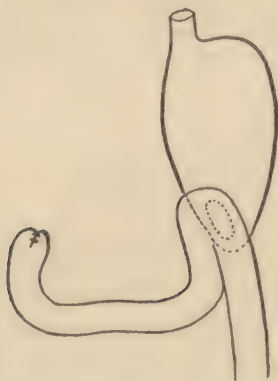


FIG. 20.—Anastomosis according to *Krönlein* in the illustration according to *Payr-Hohlbaum*.

tioned in the record of 1887 which was done in this case because on account of the stenosis of the duodenum the *Billroth No. 1*, which he always preferred, was made impossible, and because the narrow transverse stomach incision made the direct implantation into the intestinal loop more logical. He never attempted the method again. *Krönlein* personally reports fifteen cases of stomach resection in 1896, which were all done according to the *Billroth No. 1 method* (*Beitr. zur Chir.* Bd. 15, S. 311) and at the Congress of Surgeons in 1902 he only mentions in



his lecture that recently he operated almost exclusively according to the method of *Billroth No. 2*.

Now we can assume that he meant by this the modification practiced by him in one case in 1887 so that the method *Krönlein* as named by several authors (*Payr, Hohlbaum*) is meant, applied and simply called *Billroth No. 2 method*. This is contradicted by the fact that *Schönholzer* in a paper published in 1903 from *Krönlein's* clinic (*Beitr. zur Chir. Bd. 39, S. 442*) in which over 50 resections of the stomach for carcinoma are reported, on page 461, he says that since 1900 *Krönlein* operates the *Billroth No. 2* method almost exclusively *in which both lumina in the stomach and duodenum are closed and a new gastro-enterostomy is made*. Among fourteen cases thus operated only two died. In the *non-malignant* cases of the stomach that *Kreuzer* reports in an article published in 1906 (*Beitr. z. Chir. 49, S. 380*), the lateral implantation was *never again* resorted to, but in one single case, reported earlier, after which it was discontinued because in the four stomach resections which were done for non-malignant diseases, the *Billroth No. 1* method was used twice, the *Billroth No. 2* method twice. Since *Krönlein* himself took the standpoint at the Congress of Surgeons in 1898 that the end to side union of stomach and duodenum is not identical with the *Billroth No. 2* method, it is impossible to assume that although the cases were operated by the end to side method, yet, simply were named the *Billroth No. 2* method. From the information of *Schoenholzer* and *Krezer* it becomes evident that the implantation prac-



ticed by *Krönlein* November 24, 1887, *is the only case* in which the rather small stomach wound was implanted in a loop of the jejunum and *had never been repeated* up to the year 1906, *for which reason it is impossible to speak about a systematic application of this method of operation by Krönlein.*

It is the custom in surgery to designate operations that are *original* and in constant use, by the name of the author. Thus today we speak of a "*Bassini*," of a "*Kraske*," etc. Also in gastric surgery this manner of expression has found favor and will never be otherwise in spite of certain opposition. It possesses the great advantage that with the typical password one instantly knows the method employed and one can read in every text book *how* an operation has been performed in its whole course. *Narrath* in an explicit work concerning the history of resection of the stomach makes the proposition to retain only the name of *Billroth*, the proposed modifications to be named according to the name of anastomosis, in other words one should not refer to a modification according to *Krönlein* or *Reichel*, etc., but one should say "resection of the stomach according to *Billroth No. 2 method* with anterior gastro-jejunostomy or posterior."

The most favored method of the implantation of the gastric incision into the first loop of the jejunum should not be called after *Hofmeister*, but as "gastric resection according to *Billroth No. 2 method* with gastro-jejunostomia retrocolica oralis inferior." Although this is a worthy proposition it can hardly be expected to be followed. In the *Eiselsberg* clinic the



short designation of the author is not only adhered to but mostly everywhere we find in scientific publications instead of *Narrath's* proposition, the names of authors used. Thus in *Denk's* publication (W. kl. W. 1919, S. 337) three years after *Narrath's* proposal "*Krönlein-Mikulicz*" is used in all case histories and also in the text where not even the method as used by *v. Mikulicz* and illustrated in the Text Book of Surgery, is meant, but the *improved method generally used, i.e.*, of end to side anastomosis as practiced by *Hofmeister* is understood.

Upon inquiry whether or not the same disadvantages with the *Krönlein-Mikulicz* method were observed (suture insufficiency on the side of the efferent loop, opening of the duodenal stump, etc.), as recorded in the clinic of *v. Mikulicz* according to a communication by *Makkas*, *Denk replied that the resections were not made any longer by the old method, but according to the new improved method which is specified by the old name.*

*If the brief designation with the name of an author will not be eliminated, so the least that can be expected is that the reader can make for himself the correct picture from the name and can perform the operation accordingly. If the operation is to bear the name of the operator who first expressed the idea and proposed the operation theoretically, then it becomes necessary to call the now generally applied method of stomach resection with the anastomosis end to side with the reduced transverse stomach incision and the jejunum as the method of v. Hacker or "Billroth-Hacker," because v. Hacker was the first*



to express his opinion at the Surgeons Congress in 1885, therefore two years before *Krönlein* had expressed the theory that the lower part of the stomach wound could be used for the insertion of the jejunum. *Narrath* is of the opinion that if the modification of the method of *Billroth No. 2* is combined with another name it must be with the name of *v. Hacker*. He therefore refuses absolutely to accept the name *Krönlein*, etc., contrary to *Payr* who even with the slight somewhat different modifications holds to the name of *Krönlein*.

If we do wish to cite the author who has practiced a similar method for the first time at least as it is done today, then it is not *Krönlein*, but *v. Eiselsberg* who as early as 1888, in a case of extensive resection for carcinoma of the stomach, not only used the same direction of incision in the stomach, as is considered today the most suitable, perpendicularly from the cardia downward, therefore an incision running parallel to the axis of the body, but also the loop of jejunum that was carried in front of the colon was done in the same manner as is done to this day, namely, so that the ascending limb above, the descending limb below, come into a position in direct continuation of the greater curvature. If a method is to be named after the author who not only has practiced it once only, but also developed it and used it and has given good reason for the whole procedure, then it is necessary to apply to the method end to side union of the stomach and jejunum, the name of *Reichel* or *Hofmeister*, because the first named makes use of the entire transverse incision while *Hofmeister*



closes the upper part of the stomach incision and applies the anastomosis suture with the remaining portion. In literature the first method is actually named after *Polya* for the reason that under his name he published an article easily accessible in literature "The care of the stump in gastric resection," while *Reichel* in a brief discussion in the Surgical Congress of 1908, is not even referred to in the minutes of the Congress published in the *Zentralb. f. Chirurgie*. Hence it is easy to understand why authors, *Mayo*, for instance, do not speak of the method of *Reichel*, but, of *Polya*, because their attention was not drawn to the briefly mentioned method of *Reichel*, but was attracted by the elaborate work, with illustrations, by *Polya*.

Very similar are the conditions with *Hofmeister's* modification of the method of gastric resection which, for instance, *A. Wagner* designates (*Zentralb. f. Chirurgie*, 1914) as the method of *Hofmeister-Finsterer* because evidently he did not know of it and only became acquainted with it by reading in the *Deutsche Zeitschr. f. Chir.*, Bd. 128, about the modification practiced by *Hofmeister* for some time. *Modifications of methods of operation will become known if they appear in print even in a short article under the proper title*, but when they appear in a long statistical work, e.g., "Carcinoma of the Stomach," they will be overlooked in the discussion on the results of the operation.

It is not easy to demand that every author when wishing to set himself right concerning technical questions, should read every article published on gas-



tric surgery for the past thirty years in order to learn whether this or that suggestion has already been made and followed. For this purpose large text books on surgery have been published so that at least up to the next edition one can get acquainted with the important questions without looking over the literature of years back. According to my experience in 693 gastric resections the process as first performed by *Hofmeister* in making an anastomosis seems to me to be *the best*, because not only the immediate, but also the latter results are better than in the other methods. Likewise in the *Billroth No. 1* method and its modifications. *It would therefore be very important to have the method of Hofmeister appear in all the text books and manuals of surgery with an exact description of the mode of procedure*, so that the younger colleagues and country surgeons in particular, who do not have access to all of the literature would get acquainted with this method and be enabled to perform it themselves, whereby the dangers which threaten the patient with the original *Billroth No. 2* method as well as the *Krönlein-Mikulicz* can be avoided. Whether this method is called according to the proposition of *Narrath* "resection according to *Billroth No. 2* method with gastro-jejunosomia retro-colica oralis inferior" or simply as the "modified *Billroth No. 2* method" or as the resection according to *Hofmeister*, it is in my opinion *immaterial* if it is only possible by simply looking up the text books or manuals of surgery, to obtain the correct idea as to how the method is performed in detail with a view of obtaining the best results. I



designate the method in all clinical histories and also in my publications simply as "*resection with typical anastomosis*," for I have already described what is understood thereby.

The incision, in gastric resection as the anastomosis, is carried out *typically*. After isolation of the stomach and duodenum which is done somewhat different in carcinoma and in ulcer, the transverse colon



FIG. 21.—Position of the incision in the mesocolon.

is delivered out of the abdominal cavity, the first loop of the jejunum which is found to the left of the spinal column at the base of the mesocolon is searched for and marked by a fixation suture. Then the *slit* is made in the mesocolon from the base up to the arch to an extent of about 10 cm. (See Fig. 21.) The incision must be placed as nearly as possible to the *left* side, otherwise the pulling over of the mesocolon to the right side over the completed anastomosis would cause difficulties. The edges of the slit in the mesocolon are also fixed with silk sutures. At this point the colon is returned to the abdominal



cavity; the three fixation sutures lie on the left side of the abdomen. Over the mesocolon the large laparotomy pack is pushed beneath the posterior stomach wall, at the same time packs are placed laterally to the duodenum and above to the cardia. Then the duodenum is crushed with a strong clamp directly at the pylorus or in duodenal ulcer after sufficient mobilization and separation from the pancreas and ligated in the furrow thus made; then two fixation sutures are placed and one cm. away from the ligature a purse string suture is made. Now the duodenum is removed two cm. from the ligature and closed by a clamp and severed by the Paquelin cautery between the clamp and the ligature. The central end is covered by a piece of gauze. The peripheral end, while the second assistant lifts up the duodenum with the two fixation sutures, is inverted by the first assistant and the operator ties the purse string suture. Above the purse string suture comes a row of *Lembert* sutures. Finally in order to secure the duodenal stump, the remains of the lig. hep.-duod. and hepato-colicum, that is, gastro-colicum is sewed over the inverted duodenal stump by which procedure it is made to lie retroperitoneally.

Now the stomach is drawn somewhat to the left and pulled slightly downwards, thereby stretching the small omentum. Should the splanchnic anæsthesia as a result of the long duration in the preparation in a penetrating ulcer of the duodenum have worn out, another 10 ccm. of  $1\frac{1}{2}\%$  solution novocain may be injected into the small omentum next to the cardia. This renders the ligating of the omentum again pair-



less. The left gastric artery must be ligated at the point of its origin from the coeliac axis (double ligation to prevent bleeding is to be recommended).

At this point the stomach is grasped at the point of resection with a *Payr* clamp. *It is necessary that the clamp be applied obliquely to the axis of the stomach parallel to the axis of the body of the patient so that the line of incision lies directly as a continuation of the œsophagus.* The peripheral part of the stomach is closed with clamps and the stomach is severed between these and the *Payr's* forceps. The part of the stomach that remains is then closed with a continuous through and through suture to a 10 cm. wide opening at the greater curvature. After applying a good elastic *Kocher's* clamp the crushing clamp is removed. The lower part of the incision which, still open, is now temporarily closed by a wide clamp and the *Kocher's* clamp is removed. Now the part of the stomach wound already closed is absolutely secured by a double row of sutures. Then the *Kocher* clamp is again applied about three finger breadths centrally from the *cut* surface. The *left* side of the slit in the mesocolon is now pulled forward by means of the two fixation sutures and stitched to the *posterior wall of the stomach* by three interrupted sutures two finger breadths away from the closing clamp (Fig. 22).

At this point the *first loop* of the *jejunum* is drawn through the opening in the mesocolon and the loop so applied to the incision in the stomach that the *afferent limb* lies on the lesser curvature and the *efferent loop* under the greater curvature (Fig. 23).



The loop must be taken as close to the plica duodeno-jejunalis as possible, yet it must be long enough to cover also the triangular suture. After the completed anastomosis the remaining part of the stomach is returned to the abdominal cavity and care is taken

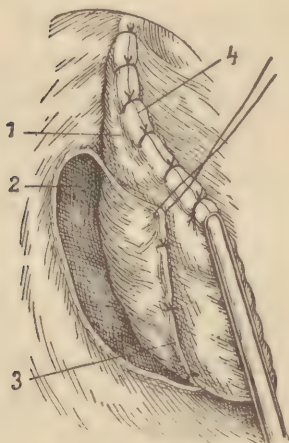


FIG. 22

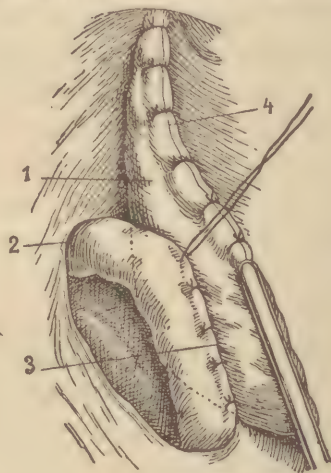


FIG. 23

FIG. 22.—Fixation of the left border of the incision in the mesocolon to the posterior wall of the gastric stump. 1, posterior stomach wall; 2, incision in the mesocolon; 3, fixation sutures of the mesocolon; 4, stomach closure suture.

FIG. 23.—Fixation of the jejunal loop to the anastomosis. 1, posterior wall of stomach; 2, afferent loop of jejunum distal from the plica duodeno-jejunalis; 3, posterior suture of the anastomosis (Lembert suture); 4, stomach closure suture.

that no kinking occurs as a result of too *short* a loop on the plica or before the attachment to the stomach. The anastomosis itself is performed 8 to 10 cm. wide with a three row suture and first with *Lembert* sutures with interrupted silk, then a sero-muscular suture also with interrupted silk. The mucous membrane suture I make either with silk (mostly in carcinoma) or with a continuous catgut suture (Fig. 24).



In order to prevent bleeding the crushed mucous membrane of the stomach is not taken away with the scissors, but with the Paquelin or galvano-cautery. In

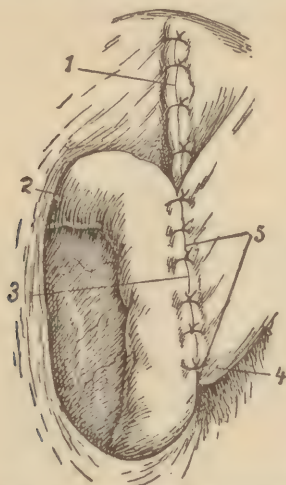


FIG. 24.—Anastomosis completed. 1, stomach closure suture; 2, plica duodeno-jejunalis and afferent loop of jejunum; 3, anterior Lembert suture; 4, greater curvature of stomach; 5, size of anastomosis.

like manner the mucous membrane of the jejunum is opened. The anterior wall of the anastomosis is likewise sutured in three layers. In order to cover

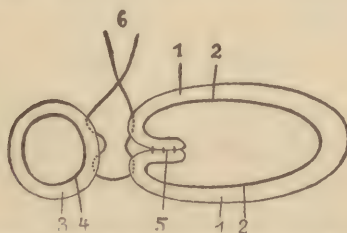


FIG. 25.—Transverse incision through stomach and jejunum in the vicinity of the safety sutures. 1, seromuscularis of the stomach; 2, mucous membrane of the stomach; 3, seromuscularis of the jejunum; 4, mucous membrane of the jejunum; 5, closure suture of the stomach; 6, safety suture.



securely the *dangerous part* where the *stomach closing sutures* unite with the anterior and posterior anastomosis sutures the *afferent loop* is fastened by three to four interrupted sutures to the stomach closing suture. In order that the loop be attached widely

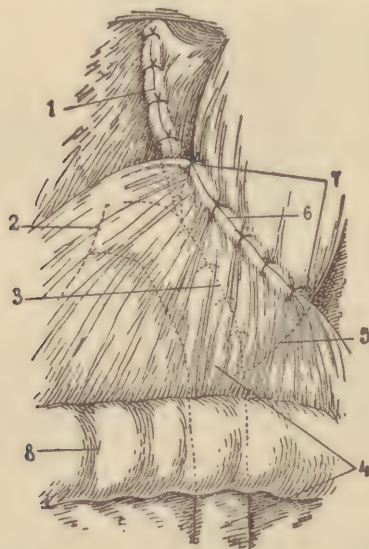


FIG. 26.—Fixation of the right border of the slit in the mesocolon on the anterior stomach wall. 1, stomach closure suture; 2, plica duodeno-jejunalis; 3, anastomosis; 4, efferent loop of jejunum covered over by the mesocolon and transverse colon; 5, greater curvature of the stomach; 6, fixation suture of the right border of the slit of the mesocolon; 7, length of the slit in the mesocolon; 8, transverse colon.

the anterior and posterior walls of the stomach and the jejunum are caught twice (see Fig. 25). After completing the anastomosis the *right* border of the slit in the mesocolon is drawn over the anastomosis and fixed by several interrupted sutures to the anterior wall of the stomach (Fig. 26). In order to prevent a stenosis of the anastomosis I apply these



sutures at least two to three cm. centrally from the anastomosis.

The anastomosis which during the operation was in the upper abdominal region, is now when *completed* below the mesocolon in the *lower abdominal*

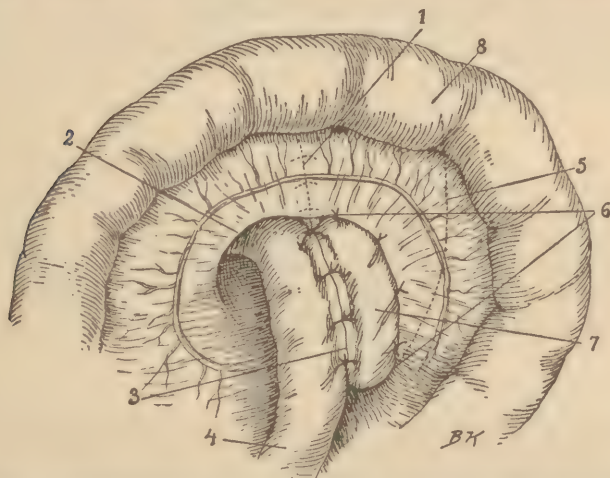


FIG. 27.—Appearance of the completed anastomosis lying underneath the mesocolon; the transverse colon is turned upwards. 1, closure suture of stomach, hidden by the transverse colon which is turned up; 2, afferent jejunal loop; 3, anastomosis; 4, efferent loop; 5, greater curvature of the stomach covered by the mesocolon; 6, slit in the mesocolon; 7, anterior stomach wall; 8, transverse colon.

region (Fig. 27). Thus it is protected from sup-  
puration in case such an accident should happen in  
the upper abdominal cavity and so that an *opening*  
*up of the sutures* when they are carefully tied is *ab-*  
*solutely excluded*. The remains of the bursa omen-  
talis are closed up by suturing in order to prevent the  
herniating of intestinal loops. If in the resection of  
a large ulcer that penetrates into the pancreas any  
portion of the *ulcer base* should *remain* or when re-



secting a carcinoma a considerable portion of the *pancreas* is resected, a drainage tube must be inserted, otherwise the abdominal cavity is closed.

The application of the anastomosis suture demands longer time if we use interrupted sutures (the average number of sutures for the entire process of stomach closing and anastomosis is between 80 to 100)

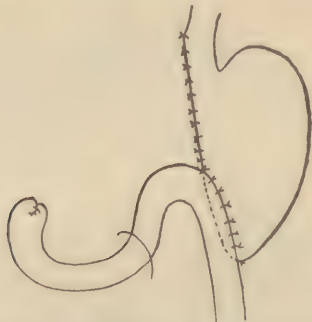


FIG. 28.—Subtotal gastric resection with resection of the right wall of œsophagus.

because under local anæsthesia the duration of the operation or the prolongation of the time of the operation is of less consequence and it can be recommended in the interest of the patient to make use of the interrupted sutures because it gives additional security to the stomach suture.

Especial difficulties may arise when resection of the stomach extends up into the œsophagus so that the *right wall* of the œsophagus has also to be removed (Fig. 28). This is only the case in very extensive carcinomata of the lesser curvature and exceptionally in large penetrating ulcers where the induration extends up into the œsophagus. The placing of the *Payr* clamp is here technically impos-



sible. We must obtain help in such a manner that we separate the stomach which is peripherally clamped off and *immediately suture, step by step, the central opening*. In order to give the utmost possible security to the suture in the œsophagus wall since it is difficult to get a good hold on account of the fact that the œsophagus possesses no serosa, it is advisable to fold the fundus of the stomach around the

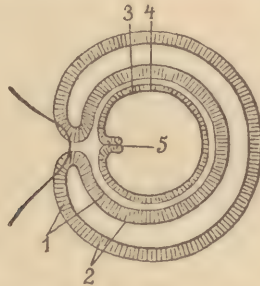


FIG. 29.—Assuring the œsophagus suture through the surrounding fundus of the stomach; transverse incision through the œsophagus and fundus. 1, seromuscularis of the stomach; 2, mucous membrane of the stomach; 3, muscularis of the œsophagus, mucous membrane of the œsophagus; 4, œsophagus suture.

sutured œsophagus in a cuff-shape manner and then close by serosa sutures, whereby we succeed in covering the place where the serosa is missing on the œsophagus by the serosa of the fundus of the stomach.

The exact relations can be observed in the accompanying illustration (Fig. 29). If there is but little of the fundus left so that the folding in of the œsophagus is only possible under tension, that suture will not hold. In these cases it is better to make the *first loop of jejunum* of such length, even before placing of the anastomosis, that we can suture it upon



the *stomach closing suture as far up as the œsophagus*.

It is more advantageous, however, in these cases and also more easily accomplished when we close the stomach in the upper portion instead of making the anastomosis the entire width of the transverse stomach incision (up to 25 cm. wide). In all cases of resection of the right wall of the œsophagus I

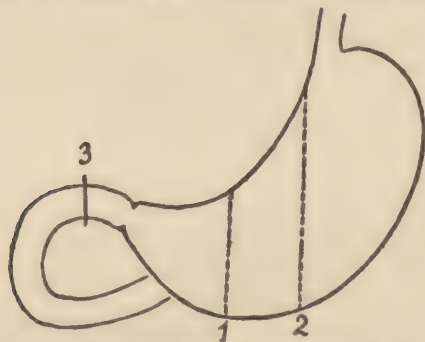


FIG. 30.—Incision in the stomach in resection. 1, incision according to *Reichel-Polya*, running perpendicular to the axis of the stomach; 2, incision according to our own method forming an acute angle with the axis of the stomach; 3, incision in the duodenum.

have previously placed a *drainage tube* in the vicinity under the liver. If there really occurs an insufficiency of the œsophagus suture then a *fistula* forms which can under circumstances heal up, while without drainage a diffuse peritonitis is unavoidable. In all cases of œsophagus suture a *jejunostomy* should be performed about 50 to 100 cm. away from the anastomosis so that the sutures may remain excluded completely from the feeding process. It is thus not advisable after making a *Witzel* fistula to introduce the drainage tube in the middle line, but a small



incision through the left rectus muscle should be made and the drainage tube drawn through it and



FIG. 31.—Anastomosis with the whole transverse incision in the stomach according to *Reichel-Polya*.

the loop then fixed by suturing into the median incision as it is easy for the fistula to leak. Moreover it does not close spontaneously after removal of the



FIG. 32.—The same anastomosis in upright position of the body turned as a result of gravity, through which the afferent loop is in the same height as the efferent loop.

tube. We would be thus compelled, in a subsequent operation, to resect the fistula (Fig. 30, 1).

*For the further course of a gastric resection the kind of incision in the stomach is of especial importance. If we make the incision in the antrum per-*



pendicularly to the axis of the stomach (Fig. 30, 1), according to *Reichel* and *Polya*, it is possible that the gastric stump which lies in the abdomen without fixation to the duodenum, following the line of gravity will turn so that the lesser curvature forms more or less the continuation of the œsophagus, the result of which will be that the *afferent loop of the jejunum* will be on the level with the descending loop (Fig. 32) so that, being situated more in the direction of the peristalsis, its filling and the *retrograde filling of the duodenum* can hardly be avoided. *Reichel* at the Surgical Congress of 1921 actually reported such retrograde filling of the duodenum and proposed an anastomosis between the duodenum and jejunum in order to avoid it.

In the discussion I pointed out that this *retrograde filling* can be *avoided* by

1. making the *incision* in the stomach not *perpendicular to the stomach axis* but oblique to it and parallel to *the body axis* of the patient (Fig. 30, 2);
2. that we do not utilize the entire cross incision of the stomach for the anastomosis, but the lower part only;
3. furthermore that the *ascending loop* must not be taken too short so that one can fasten it high up enough for the closing of the stomach wall.

In the *resection of the stomach* for the exclusion of an ulcer of the duodenum that cannot be resected, it is particularly important to avoid this *retrograde filling of the duodenum absolutely* as hyperacidity



may occur as a result of the retrograde filling of the excluded pars pylorica. If, after a gastric resection, there should occur an accumulation of blood in the stomach and thereby repeated hæmatemesis, I advise energetic gastric lavage with ice water or with very cold 1:1000 silver nitrate solution. Danger for the gastric suture is not to be feared from these gastric irrigations provided that the suturing has been made in three layers. In the *single layer suture* of *Bier* in which perforation and fatal hemorrhages are not at all rare, as I have been informed by post-mortem examiners, we would not dare to risk such lavage.

Personally I have never made the one layer gastric suture and will never make it because it looks to me too insecure. The greater amount of time necessary for the three layer suture plays no rôle when local anæsthesia is employed. Of course, it is impossible to perform the stomach closure suture and the anastomosis suture in 10 to 20 minutes, but that is also not at all necessary in operations under local anæsthesia.

### (b) *Gastric Resection for Carcinoma*

In the operation for carcinoma of the stomach we have to deal with *elderly people* as a rule, in whom more or less serious changes of heart and lungs have occurred, so that their condition as to whether or not to operate is the deciding question. Here the anæsthesia is the deciding factor *in the selection of the cases*. In local anæsthesia we can, as *Gottstein* pointed out more than 20 years ago from the material in the *v. Mikulicz* clinic, *operate on people*



*where it could not have been expected for a radical operation to be successful in general anæsthesia.*

It is clear that those surgeons who operate in local anæsthesia show more resections than those in other places where general narcosis is used, for the reason that the *contra-indications remain out of the question entirely*. While so far in most clinics *one-third* of the carcinoma cases were *resected*, in the other *two-thirds* a gastro-enterostomy or an exploratory laparotomy or jejunostomy was made. I performed in my material of 317 cases *193 resections (60.9%)*, as against 65 gastro-enterostomies and 59 exploratory laparotomies or jejunostomies respectively. Here I believe that it is best *in all cases* where clinical metastasis cannot be demonstrated with certainty to *determine the operability* of a carcinoma by *exploratory laparotomy*, so that I perform at least exploratory laparotomy in all cases, even in very cachectic individuals. The importance of exploratory laparotomy cannot be sufficiently emphasized.

Three years ago I had a patient, 51 years old. On account of the X-Ray findings for position and size of the tumor, the case was pronounced by the *internists* as well as by the *roentgenologists* as *impossible for a radical operation only one-half year previous*. He was sent to me to have a gastro-enterostomy performed because of *increasing symptoms of stenosis*. At the operation, in splanchnic anæsthesia, the tumor which reached high up on the smaller curvature was still *operable* so that contrary to the *internists'*



view of the possibility for a gastro-enterostomy alone, I was in a position to *resect four-fifths of the stomach itself*. The patient up to date, that is, three years after the operation is free from relapse. It is clear that the outlook of permanent recovery would have been much better if the patient had been sent for operation six months earlier.

In resection of the stomach for the *radical cure* of carcinoma, the entire *lesser omentum* must be re-

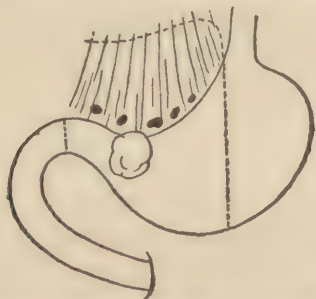


FIG. 33.—Extent of the gastric resection for carcinoma.

moved, also the *greater omentum* which according to *Groves* represents the chief lymph area of the pyloric portion of the stomach. The *extirpation of the large omentum* requires much time and a thorough hæmostasis on account of the separation from the transverse colon. I make it in all cases since 1913 in order to improve the permanent results as far as possible. Great care is demanded for the complete and exact *removal of the regional glands*.

The glands at the *duodenal angle* are affected the most, i.e., those on the opposite side of the pylorus in the gastrocolic ligament in front of the mesocolon



and situated below the pancreas. The *suprapancreatic* glands must absolutely be removed, also the gland area at the *cæliac axis*. If the latter are already microscopically enlarged then such resections are considered more as *palliative operations*. It is clear that this part of the operation requires a long time for the avoidance of accidental injuries. If the carcinoma has invaded the mesocolon then this must also be resected, which actually was done in 36 cases.

Should we fail to protect the a. colica media then the transverse colon must be advanced or resected on account of the uncertainty of its blood supply. The invasion of the right wall of the *œsophagus* by the carcinoma makes the operation more difficult, but forms no absolute contra-indication. Among my material there are eighteen cases where resection had to be extended up to the right *œsophagus* wall, in which the above described method of the folding around with the fundus of the stomach was practiced. Of these eight cases died.

Among 43 cases the carcinoma invaded the *pancreas* so that a larger part of the *pancreas itself* had to be removed. In six cases part of the liver, and in 22 cases the mesocolon had to be resected on account of the involvement of carcinoma. Because there exists here the danger that as a result of injury to the excretory ducts, a *pancreas fistula* develops or *fat necrosis* occurs, the prognosis of the operation is essentially made worse by a pancreas resection. Personally, I have had nine deaths or 20% mortality in 43 cases with partial resection of the pancreas.



If the carcinoma invades the *colon* the *resection* of the *colon* is absolutely necessary. This can be accomplished either by a one stage or by a two stage operation. I have performed colon resection in nine cases with seven deaths.

Among my 193 *resections* for stomach carcinoma only three *cases* were operated on in *general anaesthesia* (all before the year 1912). In all the other cases novocain anaesthesia was employed either alone or with the help of ether. The operations are tabulated in *synopsis form*.

TABLE II—GASTRIC RESECTION FOR CARCINOMA

	Without ether	With Ether up to							Total
		25 cm. <sup>3</sup>	50 cm. <sup>3</sup>	75 cm. <sup>3</sup>	100 cm. <sup>3</sup>	150 cm. <sup>3</sup>	More than 150 cm. <sup>3</sup>	Am. unknown	
Local (Mesentery) anaesthesia.....	82	15	16	6	7	4	4	6	140
Splanchnic anaes. after Kappis.....	7	.....	.....	.....	.....	.....	.....	.....	7
Splanchnic anaes. after Braun.....	40	1	1	.....	.....	1	.....	.....	43
Total.....	129	16	17	6	7	5	4	6	190

With the splanchnic anaesthesia which was made seven times according to the method of *Kappis*, 43 times by the anterior method of *Braun*, ether was only necessary three times. Among these was one case where the operation, on account of the removal of the enlarged glands around the coeliac axis, was



particularly difficult so that it was not ended and the efficiency of the otherwise good anæsthesia was terminated before the completion of the operation. I have operated on two-thirds of the cases of carcinoma resection under pure novocain anæsthesia without the slightest amount of ether so that in these cases we cannot speak of a combined anæsthesia. But also in the remaining cases the amount of ether employed was so small that one could never speak of a deep general narcosis. The same holds good in the six cases where the quantity of ether used was so small that it found hardly any mention, but simply was designated a "little ether." Only in eight cases where up to 150 ccm. or more of ether were used we speak of a *combined anæsthesia* according to *Franke's* idea. This makes a total of 4.6% of all resections. But here, *also*, the gain through the simultaneous use of local anæsthesia is very great.

The *immediate results* of carcinoma resection are certainly improved through local anæsthesia because among 193 resections I have to report 36 deaths, equal to 18.6 mortality. Here it is to be considered that I have enlarged the *indication limits* for resection more than most surgeons have by making the resections also with *existing metastasis of the peritoneum and ascites*. Even in *liver metastasis* I have made the *resection* in order to alleviate the sloughing and bleeding and by the removal of the primary tumor to aid the results of the post-operative *roentgen radiation*. We had strong hopes that by the treatment of the tumor with *autolysat* according to *Joanvonic's* perhaps still another such case would



remain permanently healed after a palliative resection. Among my own material the total of resections embraces two-thirds of the cases while in most clinics and surgical stations only 33% of all cases were radically operated.

*The greatest number of deaths* occurred in the *far advanced cases* especially when the right side of the œsophagus had to be resected and a *suture insufficiency at the œsophagus* was the principal cause of death (8 cases). Furthermore, the gastrocolonic resections (7 deaths), the diffuse carcinomatosis (3 deaths) and the extensive pancreas resections (9 fatal cases) had a high mortality. The cases of the profoundest anæmia in which the hæmoglobin percentage had sunk very low (*Fleischel* under 15) give an *absolutely bad prognosis* (all three cases died). In carcinoma these pronounced cases of anæmia form an absolute contra-indication against every kind of operation since even a gastro-enterostomy cannot be of any benefit. In ulcer cases on the contrary it is possible to operate such a profoundly anæmic patient with success.

The cases of carcinoma invading the pancreas, the liver, the colon and finally the right œsophagus wall, as well as the cases with demonstrable liver metastasis and ascites are *no longer* operated upon in most of the clinics. It is very doubtful whether or not it is worth while to operate in these cases at all. Likewise with involvement of the *lymphatics* at the cœliac axis operation is generally refused. It would be necessary in order to be able to compare the mortality at least with my own material to separate



the cases with invasion of the carcinoma of the neighboring organs and then compare the results. We would find that in these 77 far advanced cases the mortality amounted to 35%, while in the remaining 116 resections with 9 deaths a mortality of 7.7%.

Besides the diagnostic indications the external circumstances play a rôle. Thus it is remarkable that even after the war I met cases of death in sanatoria from peritonitis following simple resection, while I, for example, in a small hospital of the Franz Josef Ambulatorium from 1919 to the end of 1922 with 25 resections for carcinoma, only had *one death* and that on account of a peritonitis in conjunction with the *gastro-colonic resection* and primary suture of the colon, so that during the four years at this hospital, I had but 4% mortality in *resections for carcinoma*.

For the summing up of the value of the anæsthesia the *fatal cases from pneumonia* must be particularly considered. Up to this time I have to report six fatal cases from pneumonia after carcinoma resections. In three cases *novocain only* was used, no ether, and the deaths due to pneumonia should be considered, according to *Schnitzler*, cases "in spite of local anæsthesia pneumonia."

One patient, a man 71 years old, in whom a *gastrocolonic resection* was performed under local anæsthesia for a carcinoma involving the colon, without the patient experiencing even the slightest pain. After the operation the patient, who suffered from emphysema and chronic purulent bronchitis, refused, because of pain,



to do the deep breathing exercises and expectorations and even small doses of morphin could not induce him to expectorate. There occurred on the 4th day after a perfectly normal healing process (2nd day flatus, 3rd day stool, temperature normal) an increase of temperature and a bilateral retention pneumonia, to which after eight days he succumbed.

The second fatal case occurred in a 56 year old man, with a relatively easy resection; the patient had fever before the operation. The internists ascribed it to old pulmonary tuberculosis. Moreover the patient was placed in a badly heated room in the hospital (lack of coal). After six days the patient died from a bilateral pneumonia. The post-mortem showed no tuberculosis.

The third death occurred 16 days after the operation, in a man, 68 years old, very cachectic, where a very large carcinoma of the stomach involving *the pancreas and mesocolon was resected*. In this case it was possible, by careful pulmonary excursions and energetic expectoration, to keep the patient eight days with normal temperature. In *the second week* after the patient was up and about, because of deficient expectoration and simultaneous chilling there occurred a retention pneumonia from which the patient died on *the 16th day*.

This fatal case, even under the most strenuous criticism, does not belong to the mortality due to the operation and because of the long period which



elapsed after the operation (8 days) it should not be classified under mortality following local anæsthesia. *Gottstein*, in judging pneumonia due to narcosis, does not consider pneumonia and deaths that occur after three days which is certainly not correct. In three more cases ether was used as an adjuvant. Very extensive resections characterized these cases.

In one case a man, 52 years old, 20 ccm. of ether were necessary in a rather extensive resection. The gall bladder had to be removed because of carcinomatous invasion. Here ether had to be administered as an aid. The second case, age 60 years, required 70 ccm. of ether for a gastrocolonic resection.

In the third case, the possibility of a pulmonary affection due to ether must be considered. This case was a man 68 years old, native of the Bukowina where a simple stomach resection was performed at a sanatorium. Anæsthesia of the mesentery had been made and 150 ccm. of ether had been administered for absolutely *no reason* whatever, although the patient was somewhat nervous otherwise, but had no pain so that one could easily have gotten along with a "fake narcosis." The patient died within 48 hours under the picture of a bilateral lobular pneumonia. *This death could have been prevented without doubt by avoiding general narcosis and operating in splanchnic anæsthesia.*

*The value of local anæsthesia in resection particularly in elderly persons deserves consideration. In local anæsthesia the patient, no matter how old, can*



*be operated on with good results.* Among my material patients over 60 years of age are found to be especially numerous which may be explained by the fact that I have not refused a case on account of old age on the one hand and on the other because of the old age other surgeons had refused to operate not only on account of the advanced years but also on account of the general physical condition. For this reason they either came to me of their own accord or were sent to me by other physicians because these physicians knew that under local anæsthesia such cases can be operated on successfully. *Among 193 resections there were 68 cases which were over 60 years old—34.6%. In comparison, Kelling for instance, had among his 72 resections with a mortality of 26.4% only 12 cases over 60 years, that is 16.6% of all cases. In the clinic Wælfler-Schloffer among 64 resections 7 were on patients over 64 years of age, all of whom died, and also Kelling among 12 cases showed 6 deaths although cases easy to operate on are found among them. I have had only 15 deaths=22% mortality, among my 58 cases that were over 60 years of age. At the same time we find among those patients over 60 years old 17 cases where, on account of the involvement of carcinoma, the greater part of the pancreas and of the mesocolon had to be removed (5+); in 4 cases the carcinoma attacked the right wall of the œsophagus (2+); 4 times simultaneous colon resection had to be made 4+. Of these 25 cases that were actually inoperable, 11 died as a result of the operation while among the other 43 cases which were over 60*



*years of age, in which the carcinoma was operable according to general principles, only 4 cases died.*

A woman, 64 years old, carcinoma began 15 months before. On account of frequent hemorrhages profound anæmia existed (*Fleischel under 15*). When I was called by the last attending physician to operate, she died after 24 hours from anæmia. The patient came to operation practically moribund. The resection itself was extraordinarily easy, no lymphatic involvement present. In such a severe anæmia even the slightest hemorrhage is sufficient to prove fatal and cannot even with the most careful operating be prevented. In such cases *blood transfusion*, according to *Oelcker's* method, might prove of benefit so that they may be operated on with some degree of success. It would have been better for the woman had she been advised to be operated on several weeks earlier.

The second case suffered from advanced tuberculosis with *cavity* formation from which the patient died. In the third case it finally came, after a primarily ideal course, to suppuration of the abdominal wall and sepsis. The patient died. A clinical picture of acute septicæmia. The fourth fatal case already mentioned should be excluded because the patient died from pneumonia after he was able to be up and about.

I have therefore in the operable cases of gastric carcinoma in patients over 60 years old a mortality



of only 9.3% as compared with *Kelling's* 50% mortality. This shows a tremendous progress in the results which in my opinion can only be attributed to a definite plan of operating in local anæsthesia. As the carcinoma in the aged shows *few metastases* according to the investigations of *Schlainger*, the prognosis for the *permanency of cure* is much more favorable. Now if we are able to improve the operative results we can recommend the radical operation with safety.

The *after-treatment* must be given with special care in these old people because of the danger of development of lobular pneumonia even without narcosis. On account of the almost ever present emphysema and non-elastic thorax, the patient must be supported in breathing by methodical compression of the thorax to facilitate expectoration. The systematic employment of camphor (every two hours at least 2 ccm. camphor in oil subcutaneously) is to be highly recommended. I prescribe it in all cases.

(c) *Gastric Resection for Ulcer of the  
Stomach or Duodenum*

In resection for the non-penetrating type of ulcer, if it is situated in the neighborhood of the pylorus, local anæsthesia is as easily administered as in resection of carcinoma of the stomach. Here also anæsthesia of the abdominal walls and infiltration of the mesenteries are sufficient, as a rule, as I described ten years ago. But in deep penetrating ulcers in the pancreas which cause spontaneous uninterrupted pain, we very seldom get along with this form of



anæsthesia alone. Here it becomes necessary to resort to ether until the penetrating ulcer is freed.

Two years ago I mentioned in a résumé at the meeting of the Society of Viennese Surgeons that the use of ether had to be considered as an aid in more than two-thirds of the resections for penetrating ulcer. This has changed so considerably since the employment of *splanchnic anæsthesia* that today the employment of *ether forms the exception*. It is decidedly a great advantage of the *Braun's* method of splanchnic anæsthesia over that of anæsthesia of the mesentery. The stomach resections performed by myself for ulcer of the stomach or duodenum are summed up as follows:

TABLE III—GASTRIC RESECTION FOR ULCER

	Gastric ulcer	Duod. ulcer	Resec. of stomach for exclusion of duod. ulcer	Resec. of stomach and anastomosis (ulc. pept. jej.)	Total
Narcosis.....	3	2	.....	.....	5
Mesentery An. alone.....	30	41	18	1	90
“ “ and ether 25 cm. <sup>3</sup> .....	6	14	8	.....	28
“ “ “ “ 50 “.....	8	13	4	1	26
“ “ “ “ 75 “.....	3	6	1	.....	10
“ “ “ “ 100 “.....	7	9	4	1	21
“ “ “ “ 150 “.....	3	2	2	3	10
“ “ “ “ more than 150 cm. <sup>3</sup> .....	5	3	2	5	15
“ “ “ “ (amt. small).....	13	4	5	.....	22
Splanchnic An. after Kappis alone.....	7	13	5	2	27
“ “ “ “ and ether.....	.....	7	1	3	11
“ “ “ Braun alone.....	58	115	22	14	209
“ “ “ “ and ether.....	6	9	1	10	26
Total.....	149	238	73	40	500



From this tabulation it becomes evident that in the employment of *anæsthesia of the mesentery* 42.1% had been operated without the slightest amount of ether while in *splanchnicus anæsthesia* in 90% of the cases no ether at all was necessary. Actually during an average period of two hours 25 to 50 ccm. of ether are such a minute quantity that one cannot even mention a transient narcosis because as is well known more than 50 ccm. of ether are required for an actual general anæsthesia. Only such cases in which 100 to 150 ccm. or more of ether have been employed are we permitted to speak of a combination anæsthesia as under these conditions the patient, even if only superficially, were narcotized. If we add also those cases where the quantity of ether is not exactly required to the combination anæsthesia, although small quantities of ether were used, we obtain a result that only 59 times, that is, 28% narcosis, is added to the mesenteric anæsthesia.

The condition in the splanchnic anæsthesia is much better since here in 244 cases only in 24 cases ether became necessary as a supplement to the splanchnic anæsthesia, therefore 90% of all cases could be operated on *without the use of ether*.

Even in the 24 cases with ether support the quantity was very small. In five cases ether was required to complete the splanchnic anæsthesia. In one case on account of the *too short duration* of the anæsthesia and because the painful preparation of the penetrating ulcer was not completed, either a repetition of the splanchnic anæsthesia or an ether narcosis became necessary. The splanchnicus anæ-



thetia *failed* probably on account of the severe *adhesions* which made difficult the diffusion, or possibly because the  $\frac{1}{4}\%$  novocain solution used was not sufficient.

Many colleagues who question the possibility of a painless resection under novocain anæsthesia alone without being convinced of the correctness of their assertion, repeatedly take the stand that the operation is begun under local anæsthesia, that in all cases ether has to be resorted to, so that it is unjustifiable to speak of an operation in local anæsthesia.

In contra-distinction to this I wish to emphasize the fact that not only with resections of carcinoma, but also with *resections for ulcer in 309 cases*, in 68% of cases, *I did not use one drop of ether*, that, since the employment of splanchnic anæsthesia, the percentage of operations without the aid of ether has risen to 90%. In these cases it is impossible to even refer to or to speak of *a combined* anæsthesia because these are operations in *pure* conductive novocain anæsthesia. If other doctors, immediately after opening the peritoneum, always use ether, the reason must be that they are not taking pains to work carefully and exactly in following the rules of local anæsthesia. If they would take pains to convince themselves of the correctness of my assertions at some of my operations they would soon become advocates of local anæsthesia. I have heard repeatedly from foreign surgeons, especially American colleagues, who were present at my operations or who assisted at them, that they believed it at first impossible that a resection of the stomach could be done painlessly



without the least additional help of general anæsthesia, but that by seeing for themselves they have become convinced of the correctness of my claim.

For the success of the operation a correct good *technique of resection* is of highest importance. The resection of the stomach for ulcer differs but little from that of carcinoma. The large omentum of course remains intact. In order to avoid a necrosis of it especially when very rich and fat do not sever the gastrocolonic ligaments below the arch, which would be more simple, but tie off the individual vessels above it, between it and the stomach. This of course, demands more time. The arch remains for *feeding the great omentum*. At the lesser curvature the severing does not reach so high upward as in carcinoma, yet it reaches in *all cases* up to the left gastric artery. The duodenal supply is immaterial as is the anastomosis suture.

If we have to deal with an ulcer of lesser curvature *penetrating into the pancreas*, provided there is no suspicion of malignant degeneration, I leave the *base of the ulcer* and separate the stomach corresponding to the inner edge of the ulcer whereby a corresponding opening in the stomach is produced. Naturally we must provide proper drainage for the ulcer base which is left in the upper abdominal region. This does not complicate the healing process. *If the ulcer base* is resected an injury to the splenic artery can hardly be avoided. This would necessitate the removal of the spleen.

Up to 1914 I performed *transverse gastric resection* nine times in the clinic *Hocheneegg*. Since then



I have *discontinued this method entirely* and in almost all cases I have done the pyloric resection instead. The stair form resection of the lesser curvature as recommended by *Schmieden*, the same as the excision of the smaller curvature, I have done only in exceptional and apparently appropriate cases (the first four times, the latter but once), especially when a hypertrophy of the pylorus was present, because I am convinced that the results obtained by these methods are certainly not better than those obtained by my own experience.

The resection of a duodenal ulcer is, as a rule, more difficult and more dangerous on account of the injuries to neighboring structures than the resection of a gastric ulcer. In order to avoid the dangers we must make quite sure before beginning of the resection *that the ulcer can be resected*. If the ulcer reaches as far as the papilla externally and the *choledochus cannot be* isolated any more from the scar tissue, then resection of the ulcer should *not be undertaken*. The operability is determined in this manner: after separating the existing adhesions between the duodenum, gall-bladder and colon, incise the peritoneum on the lateral side of the descending duodenum, then mobilize the latter and observe whether or not the cicatrix of the ulcer on the posterior wall of the duodenum reaches down to the papilla, then follow the ductus choledochus from the entrance to the cystic duct along the edge of the foramen of Winslow up to the papilla. If this is free the resection can be undertaken.

First the gastrocolic ligament is divided between



the arch and the stomach as before, the left gastro-epiploic artery is preserved for the necessary nutrition of the omentum. Then the transverse colon is delivered, the first loop of the jejunum searched for, on the left side of the mesocolon, a fixation suture is applied, the slit in the mesocolon made, the first loop of jejunum drawn through it and the colon replaced. Then begins the *preparation of the duodenum*. In ligating the duodeno-hepatic ligament we must keep *as close to the duodenum* as possible, in order to avoid *injury* to the hepatic artery which may have been drawn up by some cicatrices. In an ulcer on the anterior duodenal wall the separation of the pancreas becomes comparatively easy. When an ulcer of the posterior wall penetrates into the pancreas I leave the ulcer base behind in the pancreas. The duodenum, corresponding to the edge of the ulcer, is separated from the base of the ulcer. Thereby an opening is found in the duodenum.

If the stomach is first clamped off in front of the pylorus the parts thoroughly packed off and the ascending loop of the duodenum covered by an abdominal compress then hardly any contents of the duodenum can escape from the opened duodenum. The wall of the duodenum is separated from the base of the ulcer down to the normal intestinal wall. After 3 to 5 mm. have been mobilized the closure of the duodenum may be carried out. *In the separation of the pancreas no mass ligatures should be applied* for fear of accidentally tying off the ductus choledochus or an accessory pancreatic duct. If sufficient of the duodenum is mobilized then the



stump is ligated, purse string suture applied and finally *Lembert* suture is properly placed. *As a rule two-thirds of the stomach are removed* and the anastomosis is carried out in typical manner. For suturing the mucosa catgut is used exclusively in recent

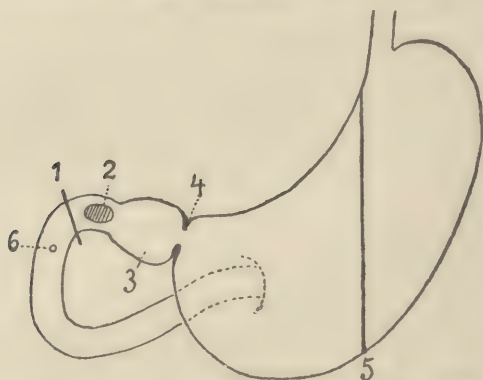


FIG. 34.—Typical incision for resection of a duodenal ulcer. 1, incision in the duodenum; 2, ulcer of duodenum; 3, pocket in duodenum (diverticulum); 4, pylorus; 5, incision in the stomach; 6, papilla.

times. The mucous membrane is divided by means of a Paquelin cautery.

The extent of the resection is illustrated in the accompanying sketch (Fig. 34). In every typical resection of the duodenum the tying off of the small omentum reaches to that point where the left gastric artery is given off the celiac axis; in this manner the whole of the small curvature falls away with all of the pyloric glands. In an ulcer penetrating into the pancreas where the ulcer base is left behind, the specimen shows a round opening in the wall. The accompanying drawing (Fig. 35) shows a preparation after resection in a 60 year old man where the



resection was performed in the stage of acute hemorrhage. As a result of the fixation in formalin the preparation has shrunk up to one-half its size.

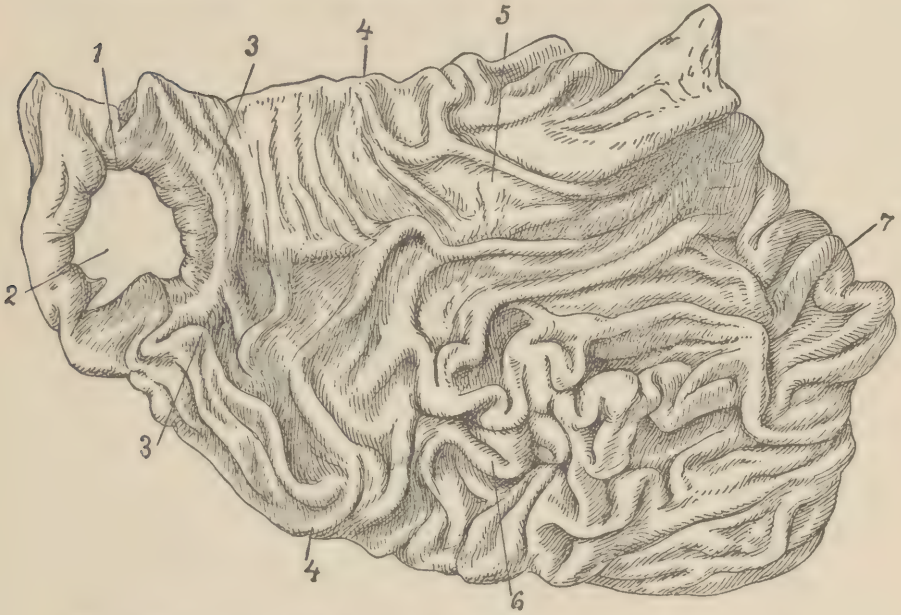


FIG. 35.—Specimen of resection of an ulcer of the duodenum, penetrating into the pancreas, anterior wall cut, preserved in formalin (60-year-old man, operated on during acute severe hemorrhage. Recovery). 1, border of the ulcer with the characteristic radiating folds of mucous membrane; the duodenal wall separated from the base of the ulcer, the latter formed by the pancreas, is left remaining, through which an opening, 2, exists; 3, pylorus much hypertrophied; 4, anterior wall of stomach cut; 5, lesser curvature; 6, greater curvature of stomach.

The ulcer of the duodenum lies directly at the pylorus (3), the opening corresponding to the ulcer shows on the border quite characteristic radiating folds of mucous membrane with an average of more than 3 cm. through which the ulcer is to be distin-



guished from an artificial opening made in the posterior wall in the duodenum.

If it should be impossible to *isolate* the *ductus choledochus* from the cicatrix of the ulcer and in spite of this the resection is made, then it may happen that the *laterally eroded choledochus* is left in the base of the ulcer as the result of which a biliary fistula is bound to occur. Closure of the choledochus by suture in the scar is impossible. Then nothing else remains but to cut the choledochus above the scar and perform a complicated anastomosis with the duodenal stump, or eventually to make an anastomosis with a loop of jejunum. Since this sort of operation increases the mortality unjustifiably it is necessary to recommend, *in all cases, in which the choledochus cannot be isolated any more to perform no resection of the ulcer*. If an ulcer of a duodenum, on account of its anatomical extension, cannot be resected then I make instead of the unilateral exclusion of *v. Eiselsberg*, *the resection of the stomach for the exclusion of the duodenal ulcer*. I have recommended this as the ideal *typical method of operation* in the *Zentralblatt für Chirurgie*, 1918, and pointed out that two-thirds, apparently normal, of the stomach must be removed at the same time.

This method was declared unjustifiable and directly illogical and completely ignored by *Haberer* while *Hofmeister*, *v. Eiselsberg* and others recognized it and operated accordingly. The method *differs from* the unilateral exclusion of *v. Eiselsberg* only that after dividing the stomach in front of the pylorus to the central part of the stomach at least two-thirds



are cut away and the anastomosis is performed with the reduced part of the gastric stump. The method proposed by me for the removal of a large portion of the stomach differs from the exclusion practiced by *Kelling* in that the dividing line is placed farther away from the pylorus while the entire antrum is left behind, so that hyperacidity and the formation

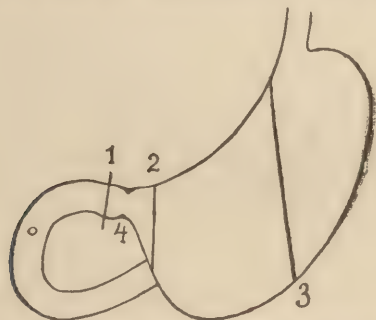


FIG. 36.—Incision in resection for the exclusion of an inoperable ulcer of duodenum. 1, incision in the duodenum near pylorus; 2, incision in the antrum; 3, incision in the stomach.

of a peptic ulcer of the jejunum are likely to occur again. *Denk* has seen this happen very rapidly in two cases.

The *technique* of *resection* for exclusion is as follows:

After separating the gastrocolic ligament between the arcade and the stomach, the lesser curvature is ligated corresponding to the center of the lesser curvature and divided from the pyloric end after ligating the arteries individually. In this manner a small flap exists on the lesser curvature which is later used to make more secure the closing suture of the stomach. At this point the stomach is divided *two finger breadths in front of the pylorus* (Fig. 36, 2).



If the stomach wall is much *hypertrophied* it will require even three finger breadths from the pylorus to the dividing line in order to prevent disturbance of nutrition by the inversion suture. The peripheral stump is closed with a continuous suture and the clamp removed and by a single row of Lembert interrupted sutures the stomach closing suture is

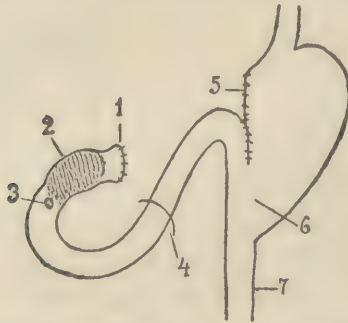


FIG. 37.—Completed resection for exclusion. 1, blind closed remains of antrum in front of pylorus; 2, ulcer on the posterior wall of the duodenum, that extends from the pylorus to the papilla; 3, papilla; 4, plica duodeno-jejunalis; 5, stomach closure suture; 6, anastomosis; 7, efferent loop of jejunum.

inverted. The gastrocolic ligaments on the side of the larger curvature and the flap left of the lesser omentum on the other side are folded over the closing suture and fixed there. The central part of the stomach is then drawn forward, the small omentum is tied high up at the origin of the left gastric artery, the *Payr's* crushing clamp applied *diagonally to the axis of the stomach* from the lesser to the gastric curvature parallel to the body axis, the stomach severed, the upper part closed, the anastomosis end to side with the lower part performed in a typical manner (Fig. 37). For the mucous membrane su-



ture I use catgut exclusively. The sides of the resected portion of the stomach vary from 10 to 15 cm. in the lesser and 15 to 30 cm., yes, as much as 40 cm., on the greater curvature according to the size and dilatation of the stomach.

If the ulcer does not extend to the pylorus, but 1 cm. of the duodenal wall is free, then we can remove the pylorus also because the duodenum is separated and closed. The removal of the pylorus has the great advantage that the closure of the peripheral lumen can be made much quicker, that besides the pylorus, which according to *Haberer* is said to be the chief cause of the frequent occurrence of peptic ulcer of the jejunum after pylorus exclusion, disappears. But the removal is permitted only then when the ulcer does not extend as far as the pylorus since otherwise the closure remains insecure and there may occur diffuse peritonitis due to incomplete closure of the abdomen as a result of the breaking of the duodenal suture. Since in the permanent results there is no difference whether the pylorus was removed or left remaining, I hold, in the interest of the patient, the removal of the same indicated only then, when the duodenal closure is to be attained with absolute certainty.

In resection for the exclusion of ulcer it is absolutely necessary to *prevent the retrograde filling of the duodenum* and with it the excluded portion of the stomach at the same time because by allowing food stuffs to enter *hyperacidity* may be reproduced in the cardiac end of the stomach as shown by experiments made by *Kelling*, which naturally favors the



development of a peptic ulcer of the jejunum. This *retrograde filling* can be best *avoided* by not placing the dividing line of the stomach perpendicular to the stomach axis as is done in the procedure of *Polya* and *Reichel*, but oblique to the stomach axis (Fig. 30) so that the finished anastomosis runs parallel to the body axis from above downward, and furthermore that the entire section is not used for an anastomosis, but only the part along the greater curvature, and the ascending loop of jejunum is fixed high up to the closing suture.

*The results of gastric resection* for ulcer have been wonderfully improved by the discontinuance of deep general narcosis. While most of the surgical clinics, in spite of selection of the cases, still show a mortality of from 8% to 10%, I have operated on all cases within the last six years without choice, yet deducting all cases of resection done during acute severe stomach hemorrhages and perforation. This deserves particular mention. I had in 418 resections 26 deaths or a mortality of 6.2%. Since the conclusion of the war the *mortality* in 304 resections has been reduced to 8 deaths or 2.6% due to the lack of deaths from peritonitis in the sanatoria (inefficient sterilization).

The results in my cases of *resections of duodenal ulcers* which are considered exceptionally difficult by many surgeons, are particularly good. I have had among 215 resections of the duodenum and at least one-half of the stomach seven deaths or a mortality of 3.2%, or during the last four years among 168 resections only three deaths (one fatal hemorrhage



in a case with high grade liver cirrhosis, one peritonitis, one case of hemophilia with suppuration) =1.8%.

It must be particularly mentioned that not one fatal case from so-called operation shock or heart failure within twenty-four hours can be shown, although old and very cachectic individuals (body weight 29.5 kg.) were not excluded from resection, and cases were included where the operations having been designated as hopeless were refused by other surgeons.

Especially significant for the efficacy of local anæsthesia is a woman, 62 years of age, who, on account of an ulcer penetrating into the pancreas from the lesser curvature, suffered such excruciating pains that she was on the verge of suicide. In this case a prominent professor of surgery, although a convinced advocate of general narcosis, refused to operate in spite of the patient's demands for relief from the pains. He explained his position to the relatives that a gastro-enterostomy was uncalled for on account of the absence of vomiting, that resection on account of the location of the ulcer, the general condition and the age of the patient was an absolutely hopeless undertaking and would be equivalent to committing murder on the patient so that no surgeon could attempt it. I performed subtotal resection of the stomach on this woman in the Garrison Hospital No. 2 under anæsthesia of the mesentery for the mobilization of the large ulcer situated near the cardia and penetrating into the pancreas and used 80 ccm. of ether. The woman not only



withstood the operation splendidly, but was completely cured and up to today, seven years after the operation, is healthy and has gained over 20 kg.

*In general anæsthesia I would have refused to operate just as the first consulting surgeon did on account of the bad general condition of the woman and the great risk involved, but in local, the resection seemed to me, like in all other run down cases, which were all discharged cured, at least a possibility of a cure.*

Post-operative *peritonitis* which is always caused by *external infection* (insufficient sterilization) and during the war was not an uncommon occurrence, I am sorry to say cannot be prevented entirely by local anæsthesia. Insufficiency of the suture or the opening of the duodenal stump was never observed.

With due emphasis I point out that among 415 *gastric resections for uncomplicated ulcer* I have *not had a single death from pneumonia*, although cases with chronic purulent bronchitis and emphysema have been subjected to resection in the same manner. That in some of the cases we had to deal with localized foci on account of insufficient expectoration and retention of secretions is hardly surprising. With corresponding treatment these foci disappeared rapidly.

Also in *old people* (60 to 70 years of age) *the results are exquisite. Forty-three such patients were all cured.* This is so much more remarkable because the women compared with the men are in the minority (six women to thirty-seven men). In thirty-six cases novocain anæsthesia alone was sufficient (twen-



ty-one times splanchnic anæsthesia; twenty-two mesentery anæsthesias), seven times ether (10 to 80 ccm.) was necessary where on account of heavy cicatrices in the lesser omentum splanchnic anæsthesia was not possible and anæsthesia of the mesenteries did not suffice. *Temporary retention of secretion* happened several times during the first few days, but was of slight consequence. Only in a 63-year-old Colonel with a *covered* (gedeckte) *large penetrating ulcer into the pancreas at the lesser curvature* 80 ccm. of ether were necessary, because on account of adhesions to the liver, where the mesentery anæsthesia was at first impossible, there occurred a severe pneumonia which eventually recovered. This patient had passed through several attacks of pneumonia but, in spite of it all, resection was absolutely necessary, because malignant degeneration of the *penetrating ulcer was expected*. The patient was, 5½ years later, still well.

That no death from pneumonia occurred in old people is certainly to be accounted for by the exclusion of general deep narcosis and the efficient after-treatment. That we had not to account for a case of fatal peritonitis which had demanded its toll in *younger people, I attribute to accident*.

The *permanent results* actually do not belong here, yet they deserve passing mention. *The best permanent results* are obtained if a great deal (at least two-thirds) of the stomach is removed. Thus far among my resections for ulcer of the stomach or duodenum no peptic ulcer of the jejunum has come under my observation. As to the fate of the latter,



investigations have been made. It was found that *after duodenal resection 93% were absolutely without complaint, the remaining cases had slight difficulties* which were however due to other troubles (ventral hernia, gall stones, etc.). *There were no uncured cases. The removal of the antrum alone* (that is one-third of the stomach) *does not suffice in order to secure permanent results*, peptic ulcer of the jejunum occurs. I have certainly seen three cases of peptic ulcer of the jejunum that were operated on by *Lorenz* who with *Schur* sponsors this operation. They were treated by resection of the antrum. One case I recently had the opportunity to free from the ulcer by an extensive resection. *Schur* found by later investigation three non successes. It must yet be decided by accurate clinical observations whether the removal of one-half of the stomach in duodenal ulcer will bring permanent results or whether it is not better to remove at least two-thirds of the stomach.

The permanent results are very good in resection of the stomach for exclusion of inoperable duodenal ulcer also much better than in simple gastro-enterostomy which *Haberer* and *Schmieden* recommend in these cases. As early as two years ago I was able to confirm the fact of the absolute freedom from complaints in 80% of my cases. Further investigations that are not yet concluded reveal *over 90% good results. Only one case of peptic ulcer of the jejunum occurred after operation.* This case was first operated on in 1919, hardly one-half of the stomach being removed (which I did again at the time because the removal of larger parts was pro-



nounced as absolutely unjustifiable). *By retrograde filling* of the antrum hyperacidity was continuously maintained so that finally an ulcer developed reaching up into the œsophagus. *Gastro-enterostomy* (*Hohlbaum*) gives in duodenal ulcer only 62% satisfactory results; according to *Haberer* only 37%. I have on the contrary as high as 90% freedom from complaint so that the patients can eat almost anything. At the same time with my method the danger of peptic ulcer of the jejunum is less than in gastro-enterostomy (according to *Hohlbaum* 10%). For this reason I give preference to my own method of resection over that of gastro-enterostomy as recommended by *Haberer*.

(d) *Gastric Resection for Peptic Ulcer of the Jejunum*

The radical operation of a peptic ulcer of the jejunum is one of the most difficult in abdominal surgery. Its exact performance demands time on account of the separation of adhesions and the necessary double anastomosis (2½ to 5 hours' duration for operation). *But in spite of* this the results *are nevertheless exquisite* just as good as in simple resection of the stomach. Personally I have up to this time operated on thirty-one cases of peptic ulcer of the jejunum, besides nine cases where, with the resection, there co-existed an ulcer of the stomach or duodenum; the anastomosis in itself was free but the *existing scars* gave evidence of *healed up* peptic ulcers. In most of the cases I had to deal with ulcer after gastro-enterostomy, seventeen times



posterior, three times anterior gastro-enterostomy, four times *pyloric exclusion*, six times peptic ulcer after resection of the pylorus and a part of the antrum. Among these were two cases in which I had to perform resection of the anastomosis with almost one-half of the stomach on account of peptic ulcer of the jejunum after gastro-enterostomy. In one case the ulcer occurred after *resection for exclusion*.

Since in radical operations for peptic ulcer of the jejunum we have to deal with a very extensive and time consuming procedure, it is clear that even in a beginning good anæsthesia ether becomes occasionally necessary when the anæsthesia wears off, but a relatively small amount suffices.

Among forty anastomosis resections eleven were operated on in local anæsthesia (mesentery anæsthesia). In ten cases ether was required as a support. In spite of the long duration required for the operation (five hours) the quantity used was never more than 300 ccm., in one case of bleeding from erosion  $\frac{1}{4}\%$  novocain sufficed. In twenty-nine cases splanchnic anæsthesia was done and among these five times according to the posterior method of *Kappis*; twenty-four times anteriorly according to *Braun*. With the *Kappis* method *ether* was necessary in three cases. In the fourth case at the cessation of the anæsthesia, although it had been good up to this time, a renewal of the splanchnic anæsthesia was necessary on account of acute pulmonary tuberculosis. This time the injection was done from in front with  $\frac{1}{4}\%$  solution. In this manner this rather



complicated operation could be finished without ether. In twenty-four cases of splanchnic anæsthesia according to the *Braun* method *fourteen operations were performed to the end without ether. However novocain had to be injected again into the small omentum next to the cardia on account of the long time required in operating.* Since the most difficult part of the operation, the freeing of the stomach and duodenum was done in good time the anæsthesia answered the purpose completely. The abdominal walls, of course, had to be re-injected in all cases before suturing. *We deal in these cases, in spite of the long time required for the operation, with exclusive conductive anæsthesia.* Besides splanchnic anæsthesia in ten cases ether was occasionally administered. This happened partly before the administration of the splanchnic anæsthesia for the separation of adhesions which were very profuse and particularly painful.

At other times the anæsthetic had lost its effect before the mobilization of the duodenum and delivery of the mesocolon had been accomplished. In these cases a superficial ether narcosis was given because the injection of the novocain into the lesser omentum did not appear sufficient and a new splanchnic anæsthesia seemed too dangerous because of the large quantity of novocain necessary. We did not have to deal here with a pure local anæsthesia in spite of the really very good anæsthesia, but with temporary combined anæsthesia. The greater part of the operation was in pure local anæsthesia, then a part under superficial general narcosis. For the abdominal suture local anæsthesia was again em-



ployed, yet, during the long time required the quantity of ether used was never more than 20 ccm. The quantity of narcotic is of no consequence as to the further results because in all of my operations not one case showed evil effects.

In two cases of peptic ulcer *complications dangerous to life* existed and in one case an *erosion hemorrhage* from the middle colic artery where the patient came to operation pulseless, yet, an attempt to operate was made. Here of course a  $\frac{1}{4}\%$  solution sufficed. In the second case we had to deal with a perforation of a peptic ulcer of the jejunum after gastro-enterostomy with extensive peritonitis. Here in addition to local anæsthesia 70 ccm. of ether were employed.

It must be expressly emphasized that in my 38 uncomplicated operations *I never had a case of so-called surgical shock terminating in death* although the very serious operations lasted sometimes five hours. I have also had *no fatality due to pneumonia*. *The post-operative course* was excellent in every case. Post-operative vomiting was almost entirely absent or, if present, was so insignificant that several patients who had already been operated on at a previous time under general anæsthesia and had vomited for days, were astonished that this operation was without nausea and that they experienced no vomiting.

*The radical operation* in 37 cases consisted of an *extensive resection of most of the stomach with the anastomosis, the pylorus* and adjacent portion of the *duodenum* (Fig. 38) whereby the descending loop



of the anastomosis was simultaneously removed (chiefly 20 to 30 cm.) for technical reasons and also to make sure that no particle of the ulcer was left in the descending loop, 20 to 50 cm. of the latter were simultaneously removed. Only in the first of the operated cases a small portion of the stomach

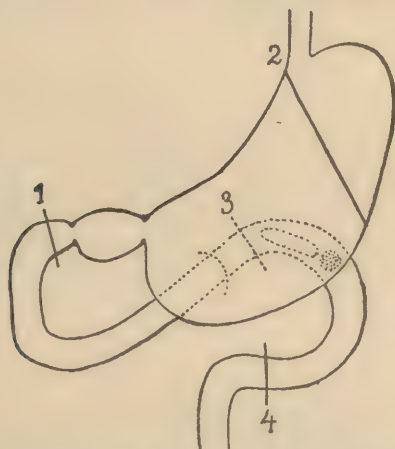


FIG. 38.—Radical operation for peptic ulcer of jejunum after gastro-enterostomy. 1, severing of the duodenum downward from the stenosing ulcer; 2, severing of the stomach; 3, incision in the afferent; 4, in the efferent loop.

with the anastomosis was removed, the anterior wall of the stomach sutured and the continuity of the intestine made perfect by a circular suture and a new posterior gastro-enterostomy made.

The union of the stomach and intestine proceeded usually either *en Y* after a blind closure of the duodenum, the descending loop of the jejunum that was also closed up tightly was united side to end with the lower part of the gastric lumen, while the ascending loop of the jejunum was implanted end



to side in the descending loop of jejunum (Fig. 39). In the cases of *anterior* gastro-enterostomy a *circular intestinal suture* was made on the jejunum and the anastomosis between the stomach and jejunum was performed end to side in the usual manner.

Recently I have tried to re-establish the continuity of the intestines by *circular suture* in posterior gastro-

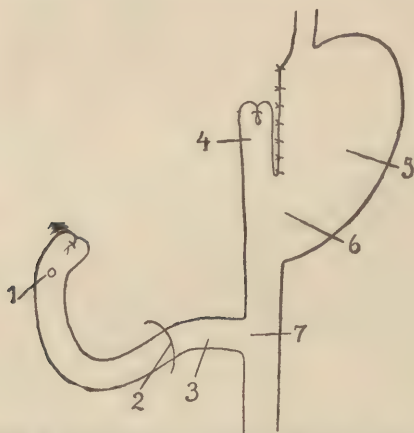


FIG. 39.—Resection completed, anastomosis “en Y.” 1, blind closed duodenum; 2, plica duodeno-jejunalis; 3, afferent loop of jejunum; 4, efferent loop completely closed; 5, cardiac gastric stump; 6, end to side anastomosis between the afferent and efferent jejunal limbs.

enterostomy and then perform the end to side anastomosis with the stomach peripherally from the intestinal suture. A mobilization of the ascending jejunal loop situated retro-peritoneally as *Clairmont* described it, I have never found necessary because after performing end to end anastomosis two to three cms. from the duodeno-jejunal plica suffices to do this because that much is left after the resection.

For the *temporary results* of the operation the



form of anastomosis plays no important part, but for the *permanent cure*, according to my experience, the *anastomosis en Y* seems rather to favor the occurrence of a new peptic ulcer of the jejunum. Irrespective of the fact that in two cases of recurrence of a peptic ulcer after resection of a peptic ulcer of the jejunum where the *anastomosis en Y* had been

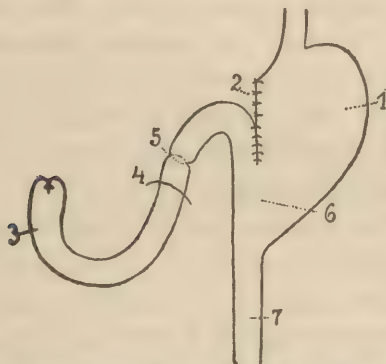


FIG. 40.—Resection completed, end to end and end to side anastomoses. 1, cardiac gastric stump; 2, stomach closure suture; 3, duodenum; 4, plica duodeno-jejunalis; 5, circular intestinal suture in the jejunum; 6, anastomosis, end to side; 7, efferent jejunal loop.

done, several of the remaining cases so far as the permanent results are known to me, have complained occasionally of trouble.

In eight cases after resection of the stomach and jejunum and after circular suture in the jejunum the duodenum was united again with the stomach according to the *Billroth No. 1* method. Here five times *end to end* union between the stomach and duodenum was made while in three cases *Haberer's modification of Billroth No. 1* method was employed. (Implantation of the reduced gastric suture line in



the descending loop of jejunum end to side). *Baum* and also *Haberer* demand to restore again, if at all possible, *the normal relations* between the duodenum and stomach *by an anastomosis* after resection of a peptic ulcer of the jejunum. As I have mentioned before I cannot convince myself that by this method the permanent results become better than with the end to side anastomosis between the stomach and jejunum as I have previously always practiced.

Among my eight cases according to the *Billroth No. 1* method, while I cannot complain of any immediate fatal result, the further fate is not as favorable as the cases previously operated on. In one case after a faultless course for two weeks, during which time the patient who enjoyed all kinds of food began to vomit, which finally became more and more severe so that the patient was in a very enfeebled condition before the operation. He died six weeks later from starvation. (The case has already been reported on page 156.) At the autopsy there was found a circular dehiscence of the suture line corresponding to the anastomosis between the stomach and duodenum. If I had closed the duodenum in this case completely as formerly and performed an anastomosis between the gastric stump and the jejunum, this case would have remained just as well as the other cases.

*The immediate results of the operations* are also *very satisfactory* after a radical operation. The two cases of *perforation* of the ulcer with peritonitis and *erosion-hemorrhage* must be excluded from consideration. Among the 38 uncomplicated cases, we had to deal 29 times with radical operations for large



peptic ulcer of the jejunum by extensive resection of the stomach.

*Only one case died* as a result of the operation. I have had therefore in the difficult radical operations of peptic jejunal ulcers 28 recoveries and one death, that is, 3.4% mortality. This one death was due to a peptic ulcer of the jejunum *after resection of the stomach for exclusion of an inoperable duodenal ulcer* which had been performed by myself two years previously. In this case there had occurred a retrograde filling of the duodenum and the excised pylorus which could be confirmed repeatedly by X-Ray examination. Because of this, hyperacidity was continuously present after the resection. Besides a relatively *small part of the stomach was resected* (the case was operated on in 1919 when I was more conservative with the extent of the resection), so that the case was quite similar to the simple unilateral exclusion of *Eiselsberg*. The old *hyperacidity* complaints occurred again immediately after the operation so that the patient was compelled to take a great amount of alkalies. At the operation a very large ulcer *penetrating into the pancreas* was found which not only involved the anastomosis loop *but also the whole posterior wall of the stomach to the œsophagus* so that the resection had to be extended necessarily to the right side of the œsophagus, whereby the performance of the anastomosis became almost impossible. There actually occurred the formation of an œsophagus fistula which necessitated a second *jejunostomy*. *At the same time* the man who had suffered at the first operation from very profuse sweats for



three days, but on one side only, had an enormous serous exudate which made the use of ether necessary (230 ccm.). This favored the occurrence of a lobular pneumonia which with suppuration in the subphrenic space caused death.

With the nine resections of the anastomosis where no fresh peptic ulcer of the jejunum was found, but where the old ulcer was still present in the stomach or duodenum, I have also to report *one fatality*.

This case was an officer, 45 years old, with severe gastric *crisis* resulting from a progressive *tabes* on whom two years ago, on account of an acute *perforation* of a duodenal ulcer, the closing suture was done, where later, on account of the reappearance of pains, a *posterior gastro-enterostomy* was made. The patient continued to complain, although repeatedly treated by internal medication without results. Since blood was found continuously in the stool as well as in the stomach contents and a severe hyperacidity existed the patient urgently demanded relief from his pain. The resection was done in spite of the *tabes* and although the stenosed old ulcer was found in the duodenum, no fresh ulcer at the point of the anastomosis but scars were present. The resection was carried out in the typical *en Y* manner. After closure of the anastomosis the arcade leading to the anastomosis loops was injured by one of the assistants. A large hematoma formed so that a part of the loop had to be resected again in order to maintain the end to side anastomosis in the jejunum. The



jejunum was not done side to end, but end to end with the open lumen of the stomach whereby the lumen became too narrow and the suturing so unsatisfactory that the three angled sutures could not be made secure. After a good course in the beginning on the fifth day suddenly indications of perforation occurred and the patient died on the sixth day under symptoms of peritonitis. In spite of severe tabes and morphinism this case must be considered in the statistics as of faulty technique. The end to end anastomosis was not sufficient. The anastomosis should have been again resected and done over a broader area. If we consider the nine cases of resection of anastomosis with one additional fatality, I have among 38 *extensive resections of the stomach and anastomosis*, 2 fatal cases, that is 5.2% mortality. This number is very small in consideration of the seriousness of the operation, hardly larger than in the ordinary resections of the stomach.

### (3) GASTRO-ENTEROSTOMY

The exclusion of deep general anæsthesia in gastro-enterostomy is of special value because the cases of *acute dilatation of the stomach* which were formerly erroneously called *vicious circle*, have almost entirely disappeared. This was more minutely discussed in the General Part page 27, i.e., that in *chloroform* anæsthesia and lately also in ether narcosis there occurs a more or less high grade atony and dilatation of the stomach. With a posterior



gastro-enterostomy the stomach filled with liquid lies upon the jejunal loop which is fixed to the stomach and thus compresses it. Since the loop is also parietic the stomach contents do not move onward but accumulate, thereby causing vomiting of *great quantities of liquid*. This condition is usually called *vicious circle* or *arterio-mesenteric duodenal occlusion*. Actually we have to deal here with nothing less than a *high grade gastro-intestinal atony*.

In re-laparotomy of such cases we find the stomach dilated, without the least peristalsis, the ascending loop of jejunum full, the descending limb filled to a certain extent becomes then gradually empty. This condition I could observe when I did a re-laparotomy in the clinic *Hochenegg* on a patient who had been operated on by one of my colleagues for gastro-enterostomy under *Billroth mixture anæsthesia* on account of uncontrollable vomiting. *Kausch* saw a similar case and claimed that the so-called *vicious circle* was caused by an acute gastric atony following posterior gastro-enterostomy. Upon the basis of my own personal experience I cannot agree with this opinion, because these cases are hardly ever observed at the present time. It is absolutely impossible to speak here of *arterio-mesenteric duodenal occlusion*, except when an actual compression of the duodenum by the superior mesenteric artery existed. This occlusion would be absolutely indifferent on account of a well functioning gastro-enterostomy, because the stomach contents would empty into the jejunum through the anastomosis placed below the occlusion.



I cannot discuss in this place more minutely the relationship of an *acute gastric dilatation* to *arterio-mesenteric duodenal occlusion*, but refer the reader to my article in the *Deutsche Zeitschr. f. Chir.*, 1920, vol. 154. *Only a therapeutic reference* is here added. In order to make possible an emptying of the atonic stomach through the anastomosis it is necessary to remove the compression from the descending loop of the jejunum leading from the anastomosis. This can only be accomplished by placing the patient *flat on the abdomen*, whereby the jejunum now lying above the stomach is gradually relieved and the stomach slowly recovers its tone. If we think of an operation at all in such cases then the *arterio-gastro-enterostomy with entero-anastomosis must be made*. We thus relieve the patient of the painful position of lying on the abdomen during the first days. It is self-evident that for the second operation local anæsthesia only is used because a renewed narcosis would increase the central paralysis.

As compared to resections, *gastro-enterostomies* have become *rarer* in my material and recently have been performed in occluded but *inoperable carcinomata of the stomach* on account of stenosis due to carcinoma of the gall bladder. *Among the 65 gastro-enterostomies* for stenosis of the stomach for carcinoma four cases were done under general anæsthesia (all ten years ago) and in 43 cases infiltration anæsthesia of the mesenteries was sufficient. In ten other cases during exploration to determine whether the case was operable or not, *ether-rausch* was used; in eight cases *splanchnicus anæsthesia* according to the *Braun* method was employed.



Of the 125 gastro-enterostomies for ulcer of the stomach or duodenum seven cases were done in general anæsthesia; 82 times local anæsthesia alone sufficed; 30 times ether was used simultaneously and in 6 cases lumbar anæsthesia was made. The cases date back to the time from 1908 to 1910. Now while in those cases of gastro-enterostomy for carcinoma the *mortality* is relatively high (almost 20%), higher than in cases of resection of the stomach, I have in those 125 gastro-enterostomies for benign diseases 9 fatal cases, that is 7.2%. Since 4 cases out of 9 resulted from most profound anemia where the operation was done on account of acute hemorrhage, they have to be excluded in judging the mortality of the gastro-enterostomies. Of the remaining five deaths *none are to be attributed to pneumonia*. One case only died of peritonitis and that was a woman who had been operated on under *Billroth mixture anæsthesia*, developing facial erysipelas on the fifth day after operation, but after a perfectly smooth recovery so far as the abdomen was concerned, signs of peritonitis set in. In one case there occurred three weeks after a gastro-enterostomy *an erosion of the splenic artery* in the base of the ulcer with fatal hemorrhage. Two cases came to operation in a starved condition; one of whom a man, 81 years of age, had not even been able to retain milk for three weeks previous, but vomited everything. In these two cases, even after the gastro-enterostomy, death could not be prevented because of *inanition*. I have therefore among 113 uncomplicated cases of gastro-enterostomy five deaths which corresponds to a *mortality of 4.4%*.



*The technique of gastro-enterostomy* in itself is not only for the temporary course, but, also for the permanent result of certain significance. *In carcinoma of the stomach* I make almost exclusively an *anterior gastro-enterostomy with entero-anastomosis*. The posterior gastro-enterostomy I dislike for the reason that with these large carcinomata at the lesser curvature the small carcinomata in the pyloric region are all resected since a bad general condition is not a contra-indication for me to spread out more on the posterior wall of the stomach and then extend through the mesocolon. If one performs a posterior gastro-enterostomy, this can very easily become *closed* by an infiltrating cancer. The patient feels much *worse* than if no anastomosis had been made. In most cases of carcinoma of the lesser curvature there exists a retention of *gross* articles of food, while fluids can be emptied sometimes very rapidly (pyloric insufficiency) which can be proven by roentgen examination. Now when in a posterior gastro-enterostomy a carcinoma should invade the anastomosis loop, this loop becomes thoroughly enveloped by the carcinoma and stenosis will form so that the contents which go through the duodenum, cannot pass this point, and the patient is bound to *vomit fluids*. In anterior gastro-enterostomy this invasion of the carcinoma occurs much later and on account of the simultaneous *entero-anastomosis* which is located farther away from the gastro-enterostomy opening it has no such bad consequences, since the liquid stomach contents find exit through the entero-anastomosis without the least hindrance.



In *anterior gastro-enterostomy* for which a jejunal loop about 40 cms. distant from the plica duodenalis is being used by bringing the loop in apposition, a *relatively narrow slit* is made in the abdominal cavity which is bordered anteriorly by the edge of the mesentery of the jejunum, behind by the spinal column, rather by the transverse mesocolon lying in front of the vertebra, above by the transverse colon. Through this slit *other loops of small intestines* may pass and become strangulated. Such cases were reported by *Kelling, Mayo and Weber*. In order to prevent this occurrence I have for the past ten years closed over this artificially made slit by fastening the edge of the mesentery of the jejunal loop, beginning at the fixation point of the posterior abdominal wall with interrupted sutures to the abdominal wall, rather the transverse mesocolon and the transverse colon. But care must be had not to compress the colon itself by this suture. The best way is therefore to make this suture by placing the loop in the position before the formation of the anastomosis.

In the rare cases of ulcer where, for instance, on account of hemorrhage or perforation, a *posterior gastro-enterostomy* is made, I apply the loop *always obliquely* from the lesser curvature to the greater curvature and in the antrum near the pylorus (Fig. 41) as I learned 15 years ago when assistant in the *v. Hacker* clinic, Graz. The *aniso-peristaltic* implantation of the loop as practiced in the clinic *Hochenegg* has under circumstances the disadvantage *that the anastomosis*, if the loop has been applied as a continuation of the duodenum without further kinking,



comes so far to the left that in these cases especially where the plica is situated far to the left of the spinal column, the anastomosis comes to be situated on the cardiac portion of the stomach. But, if the anastomosis is placed near the fundus *a large pouch* remains beneath it, provided there is actually a stenosis

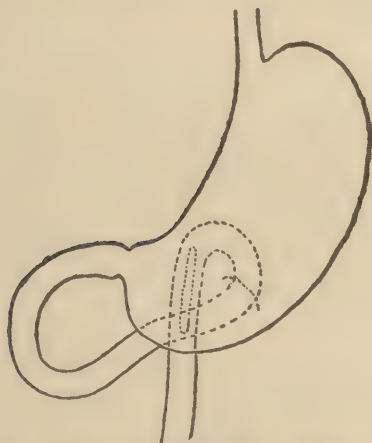


FIG. 41.—Posterior gastro-enterostomy, running obliquely from left upper (lesser curvature) to right lower border (greater curvature).

in the duodenum in which food is retained which can be proven by X-Ray examination through the existence of a quite considerable *six hour residue*. Roentgenologists then pronounce this to be *a badly functioning gastro-enterostomy* on account of its high location!

In order to avoid a *spastic closure* of the anastomosis with certainty it is to be recommended first to place the anastomosis *wide* enough (6 to 10 cms.), and second, *obliquely from the lesser to the larger curvature*, therefore from the left upper to the right



lower; by this direction of the incision not only the *oblique* muscle fibres but also the longitudinal fibres of the stomach wall are cut through *obliquely*. With a spasm in the antrum an anastomosis can *never be closed entirely*, it even will get *enlarged* by the oblique muscles *contracting* in one direction. In enormous hypertrophy of the stomach wall I *excise* moreover an elliptical piece of the stomach wall at the point where the anastomosis is to be placed. In this way the anastomosis really comes to gaping. In the broad or wide gastro-enterostomy, so far as I am able to determine about the future of these cases, the permanent results are also very *good*, provided the patients adhere to a definite diet, especially those not having undergone radical operation, in order to prevent the formation of a peptic ulcer of the jejunum.

If in posterior gastro-enterostomy the loop is taken real *short* after the idea of *v. Hacker* and besides if the ascending loop is fixed on the posterior stomach wall up to the plica whereby more of the afferent loop is taken so that this becomes stenosed, it seems quite impossible that any opening for a hernia can remain as has been observed by several authors (Bruntt, Frome) as the cause of strangulation of the intestinal loops.

In the form of an appendix *gastro-anastomosis in hour glass contraction of the stomach is mentioned here*. Fourteen years ago I did this operation three times while assistant in the clinic *v. Hacker* and always under lumbar anæsthesia. The immediate results of this operation were good. Since then I make a *resection*, for some time past, in hour glass



stomach which gives better permanent results. I have given up the performance of gastro-anastomosis entirely.

#### (4) OPERATIONS FOR ACUTE GASTRIC AND DUODENAL PERFORATION

In *acute perforation* of an ulcer local anæsthesia alone is not sufficient in the majority of cases on account of existing peritonitis, except where lumbar or splanchnicus anæsthesia is employed. A slight ether-rausch must be used at least during the cleansing of the abdominal cavity by irrigation or sponging. Among the 26 cases of acute perforation only one case was operated on in general anæsthesia 12 years ago (the patient died). Three times lumbar anæsthesia was used (one case recovered; two died), in the remaining 22 cases local anæsthesia of the abdominal walls and mesentery was employed; 20 times ether was used as a support; 19 times besides the suturing over of the ulcer *posterior gastro-enterostomy* was made, three times *gastric resection* was performed, in 4 cases simple sewing over of the ulcer was done.

If the *mortality of 44%* is considered we cannot get a favorable impression of local anæsthesia. But, it must be considered that I have *operated all cases* no matter how hopeless they appeared, which is certainly in the interest of the otherwise absolutely hopeless patient; yet, this weighs heavily on our surgical statistics. In perforation the prognosis depends upon the *time of the operation*, the size of the perforation and the quantity of the leaking stomach contents



with a subsequent *peritonitis*. In my opinion the method of operation is of minor importance. Since I hold to the standpoint of the absolute necessity of operation it is easily understood that in many of my patients the operation had already *been refused* by other surgeons.

Of the four cases with simple *suturing over of the ulcer* of which three cases died, one came thirty-six hours after perforation; one forty hours after perforation and one case even seven days after perforation, with greatly tympanitic abdomen, cold extremities, almost pulseless. It is clear that the saving of such cases would be nothing short of a miracle. In one case operation was performed 20 hours after the perforation, but in this case the peritonitis had limited itself to the upper abdomen. Because of the solid fixation of the hepatic and splenic flexure, the enormously distended transverse colon had closed off the upper abdominal region from the lower abdomen as if by an air cushion, so that in spite of the great pressure under which the pus was found in the upper abdomen by the incision none could reach the lower abdomen for the reason stated above. It is really a most wonderful protection of nature that in such cases no medication succeeds, in spite of repeated irrigations, in bringing about a movement of the bowels or the passage of flatus as in this case had been tried by the house surgeon in vain.

In ulcer of the *duodenum* or *pylorus* besides suturing over, gastro-enterostomy was always employed; only in three cases resection was done. For judging the value of the anæsthesia there remain in the first



instance those 19 cases of perforation treated by *gastro-enterostomy*. Of these 11 recovered, 8 died, that is, 42% mortality. *In the first six hours* after the perforation the prognosis is still very favorable. Among my material we find two resections that recovered, but not one case that was operated on within six hours after perforation. In the next 12 hours the prognosis grows considerably worse. Six cases were operated on 12 hours after perforation. Of these 3 died.

Male patient, 47 years of age, finger size perforation at the lesser curvature with extensive *peritonitis*. Although perforation occurred only a short time before operation the pulse had become decidedly bad. Fifty-three years old man was operated ten hours after perforation, large quantity of gastric contents in the abdominal cavity, *deficient* irrigation with salt solution. Exitus after four days from progressive peritonitis in spite of the fact that a secondary enterostomy was made.

The third fatal case occurred in a 53 years old man with a severe erosion hemorrhage from a duodenal ulcer where the early operation was not countenanced by the internists and after 36 hours perforation occurred. The patient was sent to the operating room ten hours after the perforation occurred with a very bad pulse.

Among the three *healed cases* was a lady, 71 years old, with perforation of a duodenal ulcer who was operated on 15 hours after perforation



had occurred. The pulse was arrhythmic, hardly perceptible, but improved only after an intravenous injection of adrenalin-normal salt solution so that I could perform the operation, which was in local anæsthesia, with  $\frac{1}{4}\%$  novocain solution and 10 ccm. of ether as a help when suturing the ulcer, tying off of the pylorus, gastro-enterostomy. The woman has been well since that time, over four years.

Four cases were operated on after 18 hours, two of these recovered, two died.

Fifty-one years old man with a large perforation died from extensive peritonitis. Forty-three years old soldier, who previous to operation had bled very profusely (Sahli 18) and 18 hours after the perforation came to operation with an enormously distended abdomen, pulse 160, hardly palpable, extremities already cold and cyanotic. Besides there was found a large callous ulcer penetrating into the pancreas near the pylorus with a 1 cm. large perforation and much stomach contents in the abdomen. Suturing of the ulcer, gastro-enterostomy, irrigation of the abdomen not possible any more on account of the bad general condition of the patient. Sponging. Drainage of Douglas. Pulse after the operation improved. Ten hours later death. For anæsthesia in this case 50 ccm. of a  $\frac{1}{4}\%$  of novocain solution and 50 ccm. of ether were employed.

Of 5 cases, 24 hours after perforation had occurred, 4 recovered, 1 died.



The fatal case occurred in an officer, 37 years old, who was brought to the hospital in an ambulance with peritonitis after a perforation of 8 hours standing, pulse 160, could not be palpated any more in the carotid, abdomen enormously distended, extremities cold, cyanotic, pulse did not improve even after a saline infusion. For the operation local anæsthesia and 20 ccm. of ether. There was found an opening as large as the thumb nail in the inner anterior wall of the duodenum, behind an ulcer penetrating into the pancreas. Suturing, gastro-enterostomy, washing out of the abdomen with saline solution, right enterostomy. Drainage of Douglas pouch. Operation duration 35 minutes. After the operation pulse better. No pains. After 24 hours death from peritonitis. Among the four healed cases is a 51 years old clerk with a perforation of a duodenal ulcer and diffuse peritonitis on whom operation in local anæsthesia and 80 ccm. of ether were employed. Also a 45 years old soldier, who had to stand a long transport by ambulance to the Garrison Hospital where operation in conductive anæsthesia and 20 ccm. ether revealed a large callous ulcer on the opposite side of the duodenum with a finger sized perforation, much stomach contents in the abdominal cavity. Sewing over of the ulcer with omentum, posterior gastro-enterostomy, washing out of the abdomen with salt solution by which very much material was emptied from Douglas pouch and the sub-



phrenic space. Drainage, cure. In the third and fourth cases there were perforations of the duodenal ulcer, but in much younger people, 17 years and 42 years respectively.

Of the three cases which were operated on at a *longer period than 24 hours* after perforation, only one case recovered. Of course it must be stated that while in this case a general peritonitis existed the greatest amount of the exudate was found in the subphrenic space. The other two cases died in spite of operation.

Although *I operated on every case, even if the pulse in the radial artery was not palpable any more, I have not experienced one death during the operation on account of so-called operation shock.* This fact is of extreme importance according to my opinion as it proves that the so-called surgical shock is nothing else than shock due to general anæsthesia and can be avoided by the exclusion of the deep general narcosis. The decidedly reduced blood pressure caused by peritonitis as a sequence of blood vessel paralysis can best be overcome by a few drops of *ether* which acts as one of the *best stimulants*. About 10 to 20 ccm. up to the highest 50 ccm. of ether suffice for the whole operation.

*By the combination of conductive anæsthesia of the abdominal walls and mesentery with the stimulating quantities of ether,* many cases will yet be operated on with hope of success, where before one would not have dared a simple laparotomy much less a gastro-enterostomy. Should the patient be brought



for operation within 12 hours after perforation, then it is to be hoped that even with this dangerous complication, the mortality in these cases will disappear, for even in this condition a resection can be successfully made.

#### (5) OPERATIONS FOR ACUTE HEMORRHAGES

While perforation of an ulcer is a generally recognized indication for immediate operation today, the views as to the advisability of operation during an acute severe hemorrhage, are still divided. Almost all of the *internists* and also most of the *surgeons* affirm to this day, what *Krölein* asserted in the Surgical Congress of 1906, that *the acute life threatening gastric hemorrhage is no subject for surgical interference, but should be treated conservatively and then only when the hemorrhage ceases and the patient has recovered from his anemia, can we think of operation.*

Whilst in every other hemorrhage we must endeavor to stop the bleeding by *surgical* means, we must hold fast to conservative treatment in these so important *gastric hemorrhages* for the reason that *the results of operation are worse than the results of conservative treatment*, and that by internal medication *deaths from hemorrhage are extraordinarily seldom.* Both assertions are no longer correct.

In four large Viennese hospitals during the *last ten years 190 fatalities from erosion hemorrhage*, from gastric or duodenal ulcer came to autopsy. This is certainly a great number if we consider that the deaths occurring in other hospitals as well as in



sanatoria and in private homes are not included in this number.

The assertion *that the results of internal treatment are better* than those of surgical interference, *is also not correct.* If the mortality following internal treatment is reckoned *not for all, but only for the severe hemorrhages due to ulcer*, then the mortality is not 2.5% as was formerly accepted, but at least from 20% to 40%. Compared with this the mortality following operations is not 30% to 50% as formerly reckoned, but much less.

Thus far I have operated on *54 cases of acute life threatening hemorrhage* and in all these I have 11 fatalities to report. The fatal cases occurred mostly in the *late operations*, therefore after 5—10—14 days *unsuccessful internal treatment*. The operation had finally to be performed in a state of most profound anemia because the hemorrhage could not be stopped. *These fatalities therefore should not be reckoned in the statistics of surgical interference, but of internal treatment.* In the cases where *no medical treatment* preceded the operation, and which were operated *immediately*, among my material of 22 patients, the *mortality* in earlier operations amounted to 4.5%. *Only this mortality of the genuine surgically operated cases can be compared to the mortality of those cases treated by internal medication only, which nevertheless must be accounted for in the severe hemorrhagic ulcers only and this is given by Clairmont 26%, Zweig 47%.* It is therefore evident that the mortality statistics are reversed. *With the surgical treatment it is much smaller than with the internal methods of treatment.*



The extraordinary *favorable results in the earlier operations* for acute hemorrhage I ascribe to the *exclusion of general anæsthesia*. This opinion that especially in the severe hemorrhages narcosis is to be avoided, is also confirmed by other authors, by internists (*Singer*), by surgeons (*Labat*). In operations for acute gastric hemorrhage I employ *exclusively novocain anæsthesia*; also in the *late operation* with high grade anemia I use the same, but *with 1/4% solution*. Among 54 cases 39 were done with pure novocain anæsthesia *without the slightest* use of ether, and 28 cases in conductive anæsthesia of the mesenteries; 11 cases in anterior splanchnicus anæsthesia. In 15 cases ether was employed with local anæsthesia 10 times, 5 to 20 ccm. of *ether* for the entire operation (1½ hours) and that was not used on account of pain but as a stimulant only in order to combat collapse due to profound anemia. In 2 cases 40 ccm. of ether; 3 times 50 to 80 ccm. of ether were used. In only the three last cases there occurred a temporary superficial narcosis.

By conductive anæsthesia, we are in a position in doubtful cases, to ascertain whether or not the hemorrhage originates from an ulcer or not, to perform *an exploratory laparotomy for diagnostic purposes* without injuring the patient, in order to confirm whether or not the hemorrhage is due to a *penetrating callous* ulcer or not. *I hold with Singer that the exploratory laparotomy in local anæsthesia is less dangerous to the patient than the expectant treatment in an uncertain diagnosis*. In 54 of my cases



I began the operation 3 times as *exploratory laparotomies*.

In one case a hemorrhage, due to *cirrhosis of the liver*, was considered possible. At operation there was found a *highly developed liver cirrhosis* with enormous dilatation of the veins in the stomach, *also an ulcer of the lesser curvature penetrating into the small omentum as the source of the hemorrhage*. By resection the 60 year old man was cured, while without the operation in this stasis in the liver death from hemorrhage was absolutely certain to occur. In a second case, on account of absence of complaints before the operation, intestinal hemorrhage, due to *syphilis*, was to be thought of (*Singer*). Ten hours after the onset of the hemorrhage, by an exploratory laparotomy performed by *Dr. Becher*, an ulcer in the anterior wall of the duodenum was found which perforated at the moment of operating. In this case resection cured the patient. Quite similar were the conditions in a third case of ulcer of the duodenum.

*The success of the operation* depends in the first place upon the *degree of anemia* present and with it the *duration of the hemorrhage*. The earlier the operation is done, the better are the results. In this stage also the *resection is not too great an attack*. Up to the present I have done resection of the bleeding ulcer and a large part of the stomach seventeen times in the early state (within 48 hours after the



beginning of the hemorrhage); all cases recovered. *This success has induced me to take a decided stand for early operation within 24 to 48 hours after the beginning of the hemorrhage.* In this stage the anemia is not so severe and the danger of perforation can be avoided where otherwise it might happen at any time in spite of the most energetic treatment.

I have operated two cases which were treated conservatively by internal means in which *perforation occurred into the free peritoneal cavity*, and on account of the perforation had to be operated on. In one case the fate is particularly tragic. The house surgeon, Dr. Gröbel, wished to have the patient operated on at the beginning of the hemorrhage; the consulting physician however expressed himself as against the operation under the old impression of the early dictum, "acute hemorrhages must not be operated on." In spite of careful internal treatment (rest in bed, absolutely no nourishment) 48 hours after the beginning of the hemorrhage there occurred perforation into the free abdominal cavity. A peritonitis with co-existing anemia, even in a person otherwise healthy, is hardly able to recover, much less in a man 53 years old. Both cases of hemorrhage and perforation died in spite of operation.

If hemorrhage has been treated internally unsuccessfully and in spite of it does not cease, which almost always happens in erosion of a large vessel (gastric, pancreatic, duodenal artery, etc.), then a late operation should not be absolutely declined on account of the severe anemia and the still worse prognosis, but the attempt to save the patient by



operation should be made. Under the protection of local anæsthesia (here naturally a  $\frac{1}{4}\%$  solution) such operations can be performed with success. *The results of the late operations are much worse* on account of the already existing anemia because of the 32 cases operated on, ten died. Even here the results are *better after resection* (22 resections with 6 deaths) than they are with gastro-enterostomy and can be accounted for by the better opportunity to *stop the bleeding* in a resection. If we consider that the cases are sent to operation only after experienced internists have failed to stop the hemorrhage, we must see that the mortality, under such circumstances is certainly not too high. I have repeatedly operated on cases at the Garrison Hospital where *for the 24 hours previous to operation the radial pulse could hardly be felt*, and have succeeded in curing *such cases by resection*. I shall never forget the 48 years old wife of a colonel who came to operation on the fourth day after the beginning of severe gastric hemorrhage with imperceptible radial pulse (pulse in the carotid 150) after a very celebrated gastric specialist (Doz. Dr. *Zweig*) had pronounced the patient a hopeless case for internal treatment. Here, by means of resection, we successfully removed an ulcer *penetrating into the pancreas* which was the source of the bleeding. The resection was done in mesentery anæsthesia (70 ccm.  $\frac{1}{4}\%$  solution) and 30 ccm. of ether used as a stimulant to strive against the repeated collapse and to cure the patient, who has for five years been perfectly well since then.

*The results of operations in the later stage of hem-*



*orrhage* are always better than in those cases treated by internal means alone, therefore the surgeon is certainly justified and also becomes *duly bound* even in *advanced anemia* and long continued hemorrhage to *perform the operation* (resection) after the internists have failed to stop the bleeding.

The indications for surgical interference are more difficult in the late than in the early operations. While in the early operations the patients can be cured almost with absolute certainty, protected against the danger of perforation, in the late operations the results are apt to be doubtful. The operation in these conditions means the absolute cessation of the hemorrhage, whilst even a small loss of blood may suffice to finally produce a fatal degree of anemia. It is nevertheless possible for the hemorrhage to stop so that the small as well as the large intestines may still be found full of blood while the stomach itself is empty. The decision *whether hemorrhage exists* is very difficult to make before the operation, particularly if the hemorrhage has actually stopped for 24 hours on account of thrombosis, for by *digestion of the thrombus* by the hyperacid gastric juice the hemorrhage may recur before the patient has had time to recover from the severe anemia.

*Singer* reports the case of a young man who was brought to a hospital on account of severe hemorrhage. The surgeon refused to operate on account of profound anemia though requested by the internist to do so. The patient lived five days without operation after repeated recurrence



of the hemorrhage. In this case it would have been better to stop the hemorrhage in local anæsthesia because of its long duration. At the autopsy there was found an erosion of the pancreatico-duodenal artery in the crater of a duodenal ulcer.

The cases of *profound chronic anemia* following repeated hemorrhages that are generally an indication for surgical interference are *not* reckoned among the 54 cases. Here again, as in acute hemorrhage, the conductive anæsthesia is of importance.

The best method in stopping the hemorrhage is the *resection of the bleeding ulcer*. In ulcer of the *stomach* resection is always possible. I have performed it regularly in recent years. In ulcer of the lesser curvature penetrating into the pancreas the resection becomes absolutely necessary since the gastro-enterostomy can probably stop the bleeding in a superficial ulcer. It is absolutely useless when we have to deal with a penetrating ulcer. The only death to be accounted for in my 22 early operations is to be added to the statistics of the inefficiency of gastro-enterostomy to stop bleeding efficiently, since bleeding continues from the penetrating ulcer into the pancreas (operation 10 years ago performed in the clinic *Hochenegg*). The circumscribing by suture of the coronary arteries according to *Witzel* at the utmost may be beneficial in a callous ulcer situated in the lesser curvature or an ulcer penetrating into the small omentum, but not when a perforation occurred into the pancreas.



In duodenal ulcer I do a resection when possible. *Only when the ulcer* cannot be resected even in the absence of hemorrhage, but on account of its anatomic extension toward the papilla and choledochus, I am satisfied with the *ligature of the pylorus* for complete exclusion of the ulcer, at least for two or three weeks. I make a posterior gastro-enterostomy, place upon the duodenum a large gauze tampon so that through this the anterior abdominal wall directly bulges. By means of a compression bandage this tampon is pushed firmly against the duodenum through which the anterior duodenal wall is pressed against the posterior wall and consequently forced against the bleeding ulcer, exactly as if it were being pressed down continuously by the finger. In this manner we are certain to stop all bleeding. To avoid injury to the pancreas this compression must cease after 24 hours at least.

In the *after-treatment* of the operation for acute hemorrhage all possible known remedies for the relief of acute anemia must be drawn upon. Under certain conditions *blood transfusion* for which I think the *Oelhecker* method is best. In the early operations this is but seldom required unless we have to do with an erosion of one of the main vessels which is rather a rare occurrence because usually this only happens after hemorrhage of several days standing with deep encroachment of the ulcer. In late operations which on account of severe anemia show a high mortality (I have had ten deaths in 32 operations=31% mortality), blood transfusion is of use only in those cases in which the highest degree of anemia has



been reached just before the operation through increased hemorrhage. In the cases where the hemorrhage runs an even course from the beginning, the parenchymatous degeneration of the organs as a result of the anemia has already progressed so far that it alone is apt to prove fatal.

*Very great caution must be exercised in the use of morphin before and after operation.* By the internists morphin is looked upon with favor during acute hemorrhage with the intention to lower the blood pressure and to bring rest to the stomach. *Yet morphin is assuredly dangerous*, particularly if the ordinary dose is given. We must always remember that for exsanguinated patients 0.01 morphin possesses the same effect as 0.1—0.2 for an otherwise healthy man. I have actually seen an ordinary dose given the evening after the operation by a house doctor contrary to orders. A severe toxic effect with terminal breathing (at the same time contracted pupils) where, after an hour and a half of artificial respiration, we succeeded in bringing back spontaneous breathing, thereby saving the patient's life.

*So soon as novocain anæsthesia has become the property of surgeons in general in abdominal operations and in particular in the gastric operations, then the question of operation during acute hemorrhage will have been decided.* Then all surgeons will have equally as good results in hemorrhage as well as in ordinary gastric resection.



## (6) OPERATIONS ON THE BILE PASSAGES

(a) *Cholecystectomy and Choledochotomy*

Up to this time the opinion was spread among the surgeons that gall-bladder operations necessitated deep general narcosis, therefore only chloroform narcosis (or mixed narcosis) would be efficient. It was considered impossible to get a sufficiently *deep* anæsthesia during the length of time required by ether alone. The employment of chloroform predominated and there were in a relatively large number of cases deaths for unexplained reasons and in apparently quite smooth convalescence which had been ascribed to so-called *surgical shock*. On account of these fatal cases, and the high mortality in cholecystectomy in particular, many internists are still strongly convinced opponents of operation for gall stones so that except in perforation and septic cholangitis, they advise against operation and the patient must suffer untold agony for days. When they agree to operation they demand usually a simple cystostomy instead of a cholecystectomy. The explanation of those fatal cases is traced in the first place to the severe injuries to the liver due to chloroform anæsthesia through which there occurs a liver insufficiency. This important chapter has been already discussed in the general part of this work. I therefore refer the reader to page 24.

When the patient receives an injection of *morphin* or *atropin* before the operation *deep narcosis* with relaxation of the abdominal walls can be obtained. Of course we must consider the possibility that the



number of pneumonia cases and *deaths from pneumonia* will increase with the depth and duration of the ether narcosis. Since we are now convinced that ether will exert the same unfavorable influences as chloroform, inasmuch as not only vomiting but gastro-intestinal atony also is often enough observed, also acute disturbances of the liver can be shown according to *Widal*, *Abramin* and *Hutinal*, it is evident that *deep general ether narcosis* has its dangers. It is therefore desirable, wherever possible, to substitute *novocain anæsthesia* for general anæsthesia, particularly in operations on the gall ducts. For the positive proof is given by *Widal* and his co-workers that *novocain anæsthesia exerts no dangerous influence upon the liver cells*.

The extirpation of a *large* gall bladder with a stone occluding the cystic duct can be performed in thin women with enteroptosis under *simple conductive anæsthesia of the abdominal walls*, provided severe adhesions are not present in the deep abdomen, and when the gall bladder itself is relatively movable. If in addition novocain is injected into the duodeno-hepatic ligament in the neighborhood of the origin of the cystic artery *sub-peritoneally*, cholecystectomy can be actually performed without pain. As early as ten years ago I operated by this method in a few cases of cholecystectomy without the use of ether, and so has *Dollinger* operated in this manner according to communications by *Adam* in 1913 and 1914. If however adhesions are present or the gall bladder is contracted then this anæsthesia alone is insufficient. Only by means of the introduction of *paravertebral*



conductive anæsthesia and *splanchnic* anæsthesia has it become possible to perform difficult cholecystectomy without narcosis. *Payr* in 1914 operated on two cases of cholecystectomy and choledochotomy under paravertebral conductive anæsthesia without ether according to the communication of *Jurasz*. In the same manner paravertebral conductive anæsthesia succeeded in the clinic *Dollinger* in 16 cases.

If on account of pulmonary tuberculosis we wish to avoid with absolute certainty any form of narcosis, then it is best to make a *splanchnicus* anæsthesia from in front through a median incision, and if this does not suffice to sever partially the right rectus muscle for the extirpation of the gall bladder. If it is essential to be exceedingly *saving* with the narcotic, when it is the desire at the same time to remove a diseased appendix with the *para-rectal* incision, we must make the opening in the abdomen and the *appendectomy* in *anæsthesia*; for the separation of the gall bladder a short *ether-rausch* may be employed which lasts just long enough for the separation to be done. The abdominal suture is performed under the effect of local anæsthesia while the patient is awake. This process of anæsthesia, on account of the partial use of ether, we call a "*combination anæsthesia*."

A few remarks as to the *technique of operation*.

In order to avoid any possible injury to the liver *I never permit the liver to be drawn out of the abdominal wound* during the operation as is practiced by many, but I leave the liver entire in the abdominal cavity. The preparation at the porta of the liver is thus made more difficult, but it is not any more diffi-



cult than the tying off of the hemorrhoidal artery at the promontory in the sacral operation for carcinoma of the rectum. The subserous preparation of the gall bladder I begin always at the fundus of the gall bladder and end at the cystic duct. In this manner I am best able to prevent injury to the hepatic or cystic duct. The danger of pressing the stone obstructing the cystic duct into the common duct is hardly worth mentioning. The cystic duct is doubly ligated after complete isolation and division, then covered over with peritoneum which has been separated from the neck of the gall bladder. In all cases I introduce a thin *drainage tube* into the bed of the gall bladder. The so-called ideal *cholecystectomy* which *Haberer* strongly advocates seems to me far too dangerous in spite of its enthusiastic recommendation, and besides it does not offer those advantages which are supposed to be expected from it as it is not possible to prevent the formation of adhesions. On the contrary it seems easier *for new adhesions to form* especially in completely covered over cases on account of the almost unavoidable formation of *hæmatoma*, even after the most careful hæmostasis, than where the post-operative secretions forming after the first few days are given an outlet through the drainage tube.

*Hartung* recently reported two more cases in which, after an ideal cholecystectomy, he found severe adhesions making a secondary operation necessary. The fact that sometimes even after four to six days the ligature around the cystic duct will cut through and that through the opened ducts which



were overlooked in the gall bladder bed, bile may empty out into the abdominal cavity and thus expose the patient to *peritonitis*, is absolutely beyond our control. Deaths that actually occurred in Vienna of bile peritonitis, after so-called ideal cholecystectomy, have not up to this time been recorded in the literature.

As I am convinced that a slender drainage tube, which of course must be introduced through the abdominal muscles without kinking, guarantees the drainage of blood and bile and protects against a fatal peritonitis, I continue to provide *drainage in all my cases*. The introduction of a *Mikulicz* tampon is entirely superfluous if the operation is done with care and the liver has not been lacerated. Drainage with a strip of gauze, which is still adhered to, is not necessary because it drains imperfectly and might be the cause of a bile peritonitis. *Schnitzler* recently reported just such a case. The simple introduction of a drainage tube after suturing of the choledochus suffices in all cases.

*My cholecystectomy material is relatively small* as compared with the great number of stomach and bowel resections. This is partially explained by the fact that gall stone disease occurs principally *in women* and women are excluded from military hospitals as well as from the hospital in which I have a service, namely, The Hospital of the Brothers of Charity.

Among my 158 operations for gall stones only 10 cases were operated on in *general anæsthesia* and these belong to the period prior to 1912. In all other



cases at least the abdominal walls were operated on in local anæsthesia in order to spare the greater part of the narcotic. As can be seen from Table IV, we

TABLE IV—OPERATIONS FOR CHOLELITHIASIS

	Cholecystostomy	Cholecystectomy	Cholecystectomy after Cholecystotomy	Total
Narcosis.....	1	6	3	10
Local An. alone.....	1	2	.....	3
“ “ and ether up to 25 cm. <sup>3</sup> .....	.....	6	2	8
“ “ “ “ “ “ 50 “.....	.....	9	3	12
“ “ “ “ “ “ 75 “.....	.....	11	.....	11
“ “ “ “ “ “ 100 “.....	.....	25	6	31
“ “ “ “ “ “ 150 “.....	.....	8	1	9
“ “ “ “ more than 150 cm. <sup>3</sup> .....	.....	6	.....	6
“ “ “ “ (amt. unknown).....	.....	13	2	15
Paravert.—An.....	.....	5	.....	5
“ “ and ether.....	.....	3	1	4
Splanchnic.—An. (Kappis).....	.....	7	1	8
“ “ (Braun).....	.....	20	10	30
“ “ “ and ether.....	.....	6	.....	6
Total.....	2	127	29	158

succeeded with local anæsthesia of the abdominal walls in performing the gall bladder extirpation. As a rule ether support becomes necessary, but only small quantities are needed. Considering that operations are done mostly in fat women, that on account of the long standing trouble severe adhesions exist, the possibility to get along with 50 to 100 ccm. of ether to perform this severe operation, and also that ether being given on an *open mask*, which is hardly sufficient for an ether-rausch, could hardly be expected.



In *paravertebral* anæsthesia which is always done on the right side from the sixth dorsal to the third lumbar segment, among 9 anæsthesias 5 were very good; 4 were incomplete, so that in these cases, *ether* had to be resorted to in addition. In none of the latter cases the quantity of ether required exceeded 50 ccm. for the duration of the operation. *Splanchnic anæsthesia* according to the method of *Kappis* was used 8 times, 4 times bilaterally, 3 times on the right side only and once on account of simultaneous appendectomy combined with paravertebral anæsthesia of the second to the fourth lumbar nerves. Bilateral anæsthesia was sufficient in all of the cases. Of those injected on one side only the anæsthesia was good in three cases and sufficed for the whole duration of the operation. Only in one case 100 ccm. of ether had to be used. This anæsthesia, which was good in the beginning, was not an actual failure; only it did not last long enough for the exceedingly difficult operation (cholecystectomy and choledochotomy for numerous common duct stones). The use of ether became eventually necessary for the conclusion of the operation.

Within the last two years the anterior *splanchnicus anæsthesia* of *Braun* has been in use and by means of an *angular incision* the laparotomy was made and 50 to 70 ccm. of solution injected. In two very stout women, in whom much novocain had already been used for the abdominal walls ( $\frac{1}{4}\%$  solution), for the splanchnic anæsthesia the  $\frac{1}{4}\%$  solution was also used and in both cases a perfect anæsthesia was obtained. *In the 36 cases of anterior splanchnic anæsthesia ether*



support was necessary only 6 times. In 3 cases ether was used only for the application of the splanchnic anæsthesia and for this purpose 10 to 20 ccm. of ether were sufficient, while the operation itself was performed without general anæsthesia. In 3 cases the anæsthesia was imperfect so that ether had to be used. In one case only 50 ccm. of novocain solution used for the splanchnic anæsthesia was apparently not enough on account of the extreme corpulency of the patient. In one case, a very stout woman, operated on for duodenal ulcer which required *resection of the duodenum* and one-half of the stomach, the anæsthesia, although perfect for a *short duration* required ether narcosis additionally to complete the operation. In none of these 3 cases did the necessary amount of ether exceed 100 ccm.

*The results of operation* are relatively very good. Not having excluded one case from operation on account of emaciation of the patient due to the long duration of the illness, I have not had one fatal case in 156 cystectomies as resulting *immediately from the operation or in consequence* of the much feared *surgical shock*. No fatal case occurred after operation with the symptoms of *acute yellow atrophy*.

In the 127 cholecystectomies and the 2 cases of cystostomy I have to record 4 deaths.

The *first* fatal case occurred in a woman, 53 years of age, with severe cholelithiasis. In this case infection occurred from without because water dripped from the roof of the operating room in the Garrison Hospital No. 2 on the



operating table and into the open abdominal cavity thus producing a *streptococcus peritonitis* from which the patient died on the eighth day.

The *second* fatal case occurred in a woman 44 years of age where after a simple cholecystectomy with exact preparation of the cystic duct stump and the usual introduction of a *drainage tube* which was removed on the second day with the changing of the saturated bloody dressing by the assistant, but which could not be put into place again. After a perfectly normal course (no temperature, stool or gas) there occurred suddenly on the seventh day the symptoms of peritonitis from which the patient died within 24 hours. Since no autopsy could be made it remained undecided what kind of peritonitis it was. It is very probable that there occurred a bile peritonitis due to opening of the stump of the cystic duct.

The *third* case occurred in a woman, 34 years of age, who suffered many years from repeated attacks of gall stone colic. Because of unbearable pain she made urgent demands to be delivered from the pain. But there existed also *Basedow's disease*. *The splanchnicus anæsthesia could not be employed* because the aorta could not be pushed to one side. Therefore ether narcosis after anæsthesia of the abdominal walls was done. The amount of ether used was 200 ccm. In the preparation the hepatic duct at its origin was injured as a result of extraordinarily severe adhesions. The suturing was barely pos-



sible and the drainage tube had to be introduced trans-duodenally through the ductus choledochus into the hepatic duct, and the hepatic duct had to be sutured laterally. On account of the pyloric stenosis present a gastro-enterostomy was also done.

During the further course a considerable degree of *gastric dilatation* took place, as these are now and then observed after *ether narcosis*, and yet a post-operative hemorrhage from the *gastro-enterostomy* occurred necessitating gastric lavage whereby 1,000 ccm. of bloody contents were removed. On the day following renewed hæmatemesis, again *gastric* lavage with fresh blood, but somewhat less in quantity. In the evening unexpected exitus. Autopsy not possible. The analysis of this fatal case is extraordinarily difficult on account of the lack of post-mortem findings. It is certain, however, that it *had absolutely nothing to do with the novocain*; but it is probable that *loss of blood from the gastro-enterostomy* and the *co-existing Basedow's disease* were the cause of the sudden death.

The *fourth* fatal case occurred in a doctor, 54 years of age, who suffered from severe attacks of gall stone colic for years compelling him to the regular use of liberal doses of morphin. After a *perfectly smooth post-operative recovery* for 11 days, the patient was already *up out of bed*, quite suddenly cerebral symptoms resembling encephalitis appeared in which after deep coma lasting 24 hours death occurred. Whether the



cause of the *cerebral symptoms* was an *embolic* process or a *thrombosis* of the cerebral veins or a real genuine *encephalitis* we cannot decide because of the absence of a post-mortem. A consultation of internists and neurologists failed to decide upon the cause of this positively cerebral process. I believe that this case should not be reckoned in the summing up of the *dangers of cholecystectomy* because all of the symptoms occurred after the termination of the healing of the wound. Therefore I only report a mortality in simple cholecystectomy of 2.3%, or if this last be added I have a mortality of 3.1%.

In the post-operative course there was a *severe gastric dilatation in only one case* after days of nausea and vomiting due to the general narcosis which eventually was relieved by gastric lavage. In the remaining cases the post-operative course was satisfactory, especially since that much feared vomiting, which often lasts for days, never set in. When very severe adhesions between the gall bladder, duodenum and colon had to be separated, if the descending loop of duodenum was enveloped in adhesions, then in these cases even in complete absence of narcosis there occurred *occasional vomiting* in the first days which is explainable by the stasis in the duodenum. With the beginning of peristalsis this vomiting usually ceased. *Pneumonia* and above all *pleurisy* of the *right side* were observed even when operated in splanchnic anæsthesia, yet, these conditions were due rather to the direct continuation of the diseased process.



It must be expressly emphasized that I have not *had one death from pneumonia*, although several cases operated on (8) were between 60 and 70 years of age. It must be understood that the presence of pulmonary disease existing before the operation did not prevent me from performing radical operations. I have among my material two cases where on account of *acute galloping pulmonary tuberculosis* cholecystectomy had to be performed because of the continuous attacks of pain, suitable nutrition and especially *force feeding* was an impossibility. In both cases cholecystectomy under *splanchnic anæsthesia* alone was successfully performed. Both cases not only withstood the operation well, but the pulmonary processes were brought to a standstill by suitable after-care.

In 28 cases there was occlusion of the ductus **CHOLEDOCHUS BY CALCULI WITH LONG EXISTING JAUNDICE**. It is a well known fact that the results of operation in this complication are worse than in simple cholecystectomy. Thus *Lorenz*, who always operates in deep general anæsthesia with the *Billroth* mixture, experienced 12 fatalities among 63 transduodenal choledochotomies=19% mortality, among which 2 cases died from acute heart insufficiency on the third day, one fatal case from double pneumonia. *Pauchet* (1921) had 20% mortality in choledochus stones with icterus; but when the *icterus* exists for a long time the mortality increases up to 60% to 80%. *Heidenhain* had better results, for he had, including sepsis cases, 14.8% mortality. *Kehr's* mortality is less, although it is to be mentioned that



*Kehr* used choledochus and hepaticus drainage in cases without obstruction of the choledochus. At the clinic *Hochenegg* are also reports from *Bachrach* among 27 cholecystectomies and choledochotomies 7 deaths=25.9% mortality. Among 13 cases of mobilization of the duodenum 16 deaths.

*In my 28 cases* of cholecystectomies and choledochotomies I have 2 fatal cases=7.1% mortality. These 2 fatal cases occurred a long time after operation.

A woman, 65 years of age, operated on in 1912 at the clinic *Hochenegg*, in which 5 large calculi were removed from the dilated choledochus, died after four weeks from *subphrenic abscess*.

The second case occurred in a painter, 34 years of age, who was much emaciated; died 15 days after the operation. At the post-mortem (Professor *Erdhecin*) there were found multiple hemorrhages in the abdominal walls, in the serosa of the small and large intestines with the formation of large hæmatomata, free bloody serum in the abdominal cavity, bilateral hæmothorax, general anemia as a result of a hemorrhagic diathesis. Yet, three stones, the size of a pea, were found in the left branch of the hepatic duct and four calculi, pea size, in the choledochus.

The remaining cases stood the operation brilliantly in spite of the severity of the disease and the long duration of the icterus. Among these were *three patients over 60 years of age*. Comparing these with the average results we must



*admit that by the exclusion of general anæsthesia the fatal cases occurring immediately at the conclusion of the operation can be absolutely avoided. By this alone the general mortality can be considerably reduced.*

Drainage of the hepatic duct which I regularly used up to 1918, although I was not convinced entirely of its advantages, and, in fact, the long continued fistula forms a decided disadvantage. Since then I close the single choledochus opening and besides cover it over completely with peritoneum. In multiple stones in the choledochus since 1918 up to last year I have performed the transduodenal choledochotomy in this manner, that the superior horizontal part of the *duodenum* is transversely incised and after *cholecystectomy* a stone sound is introduced through the opening in the cystic duct into the dilated choledochus. In this way the posterior wall of the duodenum above the papilla is made prominent and this projection of the duodenum is incised. The wall of the choledochus is held by clamps and sewed to the duodenal wall so that finally an *anastomosis* 1 cm. long results. Through this opening the calculi, which remain behind in the hepaticus, can pass without any further trouble.

In the ordinary drainage of the hepatic duct these stones may enter the *ductus choledochus at the papilla* and prevent the closure of the biliary fistula. *The continuous flow of bile* leads finally to cachexia and death. In this manner two of my patients died recently after 10 to 12 weeks. They had already been



up and around for quite a while and had convalesced, but succumbed to the continuance of the biliary fistula. In one of these cases a *small stone was found at the papilla* during autopsy which did not show stenosis of any great degree. If we consider what comparatively large stones are passed through the papilla with these calculi pains, it is surprising that such a small calculus could be permanently retained. Perhaps this is due to the fact that in biliary fistula the gall finds an external outlet for which reason not enough pressure exists in the bile ducts system to press or push the stones through the papilla.

After trans-duodenal choledochotomy *with splitting of the papilla* as was practiced in previous years and recently warmly recommended by *H. Lorenz*, it is possible to cause a simultaneous *acute pancreatitis* due to injury of the pancreatic duct. *Heyrowsky* has, according to a personal communication, experienced two fatal cases, where at the autopsy acute pancreatitis was diagnosed. The making of an anastomosis between the choledochus and the duodenum, even if only the splitting of the papilla, is only then indicated and justified when there are numerous calculi in the choledochus, but not if one or two larger calculi are found and removed. I am still of the opinion that it is of importance to the patient *when the valve closure at the papilla is permanently destroyed*, that is whether we do not thereby establish an anastomosis between the choledochus and duodenum which makes *ascending infection* of the bile ducts and liver permanently possible. *Lorenz* in his communication concerning transduodenal choledoch-



otomy has given us no opinion on this all important point.

In the presence of multiple calculi in the choledochus and hepatic duct, I have given up drainage of the hepatic duct entirely during the past four years. Recently I made a transduodenal choledochotomy, but not like *Lorenz* by splitting the papilla, rather by the method previously mentioned. In this way an injury of the pancreatic duct can be positively avoided, but an accessory duct might be opened in this manner and infection of the pancreas thus produced. Up to the present, among my three transduodenal choledochotomies I have not observed any ill effects, if I except a severe hemorrhage from the pancreas.

Since a year ago I have given up this method and make instead of it the same as I do where multiple stones are present, i.e., *a wide anastomosis between the duodenum and the dilated choledochus* which is split from the junction of the cystic duct to the point where it disappears under the duodenum. In this manner a sufficiently wide anastomosis is obtained so that large concretions can pass through. I make the *anastomosis suture in three layers* and finally cover it with parts of the liver or greater omentum. So far I have done this *open anastomosis* in three cases; all recovered. Naturally drainage was introduced. However, the tube was not placed directly upon the anastomosis, but laterally and separated from the anastomosis by the omentum. Only in one case bile oozed through the drainage for a couple of days, in all the rest of the cases *the sutures held per-*



*fectly so that no bile or duodenal contents escaped through the tube at any time. By this open method of anastomosis the dangers of injury to the pancreas by the transduodenal method can be absolutely avoided.* Whether after this anastomosis there can occur an ascending infection of the gall ducts can be proven only through further observations.

In order to exclude *possible icteric post-operative bleeding with success*, I have in recent times used the X-Ray treatment of the spleen in order to increase the *coagulability of the blood* immediately before the operation by which I have seen such brilliant results in cholecystenterostomy for carcinoma of the papilla.

The choledochotomy and drainage of the hepatic duct was performed in a case of *septic cholelithiasis without stenosis of the choledochus*.

This case was a doctor's wife, 50 years of age, who complained of intermittent stomach trouble and became ill three weeks previously with chills, showing symptoms of sepsis (streptococcus demonstrable in the blood stream) whose starting point could be proven by the passage of a calculus, the size of a pigeon's egg, in the stool. Because chill and fever persisted the source of infection could be located in this stout woman under local anæsthesia and 100 ccm. of ether, the cholecystectomy performed and the perforation in the duodenum closed up. In the vicinity of the gall bladder a *large abscess* was also found and *multiple small abscesses* on the surface of the liver. Therefore the choledochus



which was not dilated was incised and a drainage of the hepaticus made. The sepsis progressed in spite of this and with continuous chills *metastases formed in the knee joint and thigh* from which the patient died on the eighth day. It is remarkable that, in spite of the sepsis present and the abscess near the gall bladder *diffuse peritonitis* did not occur. On account of the numerous hepatic abscesses nothing could be expected from the drainage of the hepatic duct.

*The extraordinary favorable results obtained by the various forms of local anæsthesia alone or in combination with superficial ether narcosis (chloroform is to be avoided absolutely) justify us in demanding that the clinicians and house physicians should not treat for years internally patients suffering from attacks of gall stone disease until new complications occur or a carcinoma develops on the basis of cholelithiasis whereby it is made impossible for any kind of surgery to render good results.*

(b) *Operation for Carcinoma of the Gall Bladder*

In carcinoma of the gall bladder we have to deal mostly with an *exploratory laparotomy* through which alone the *diagnosis* must be positively established. Nothing can be expected any more by a radical operation unless the patient is so fortunate that the carcinoma develops upon the fundus of an enlarged gall bladder beyond the confines of the liver. Exploratory laparotomy is absolutely justifiable here in order to clear up a *mistake in diagnosis*.



Among my 28 cases of occlusion of the ductus choledochus by calculi there was a woman, 54 years old, with pronounced jaundice of many months standing and a large palpable tumor of the gall bladder, who had been in every surgical clinic and who had been sent away unoperated with diagnosis of carcinoma of the gall bladder. She then was received in the clinic *Hochenegg* with the same diagnosis and again would have been sent away when at the exploratory laparotomy instead of carcinoma of the gall bladder, there was found a large gall bladder full of stones and a large stone in the *ductus choledochus*. By means of cholecystectomy and *choledochotomy* the woman was cured and has been well during the past ten years.

Exploratory laparotomy was done in local anæsthesia 14 times alone; in three cases paravertebral anæsthesia was made; in 5 cases the splanchnicus anæsthesia. It is a remarkable fact *that in more than one-half of the cases of gall bladder carcinoma, gall stones and severe pericholecystic adhesions were found*. *Brütt* also found in the material of the *Kümmell* clinic that among 43 primary carcinomata of the gall bladder almost always gall stones were present. It is very probable that in the presence of calculi the chronically inflamed gall bladder is much more susceptible to malignant degeneration so that this possibility should compel us to operate for gall stones before carcinoma has a chance to develop.

The *radical operation* of carcinoma when it has



invaded the liver substance gives but little hope for success. Ten years ago I did an extensive resection of the liver with carcinoma of the gall bladder at the clinic *Hochenegg* on a woman, 45 years of age. The patient recovered, it is true, but later there occurred a relapse from which she died.

(c) *Cholecystenterostomy*

If there is a permanent occlusion of the papilla by a *neoplasm* anastomosis between the dilated gall bladder and the duodenum or jejunum comes into consideration as a palliative measure; in a contracted gall bladder an anastomosis between the *choledochus* and duodenum. Thus far I have performed this operation eight times; four times between the *gall bladder and duodenum*; twice between the *gall bladder and jejunum*; once in absence of gall bladder for a previously done *cholecystectomy*, the anastomosis between the dilated *choledochus and duodenum* in a second case after *cholecystectomy* on account of stenosis of the entire *choledochus*, an anastomosis between the greatly dilated *hepatic duct* and the duodenum was made. In 6 cases, operation was performed in local anæsthesia of the abdominal walls, in 2 cases in paravertebral conductive anæsthesia. Since the performing of the anastomosis itself is absolutely painless, on account of the general poor condition of the patient, the conductive anæsthesia alone was sufficient.

An especial danger in this operation is the post-operative hemorrhage due to *jaundice*. Because of this I have lost 2 cases in previous years from post-



operative hemorrhage. Lately, in order to increase the clotting power of the blood, I order *X-Ray treatment of the spleen* and with a so-called stimulating dose ( $1/3$  erythemdosis). In one case in which the application of X-Ray had been made 20 hours before the operation the action was so intense that the patient hardly bled at all at the operation so that an exact hæmostasis was hardly possible. In this case there occurred post-operative hemorrhage after the cessation of the action of the X-Ray from the blood vessels that were not sufficiently ligated, so that after 24 hours blood flowed from the abdominal cavity through the drainage tube. The patient died from post-operative hemorrhage. Since then I proceed by having the *X-Ray treatment given immediately before the operation* so that at the time of the operation the effect of the X-Ray has not attained its maximum because bleeding usually is present, which is favorable in the interest of a thorough hæmostasis. Since the action occurs 3 to 4 hours after the application the post-operative hemorrhage can be avoided most effectively. I have had absolutely no post-operative hemorrhage in the last 3 cases, despite the long continuation of jaundice (complete obstruction for 6 months).

#### (d) *Operations for Liver Injuries*

In operations for liver injury local anæsthesia plays an important rôle because we are in a position to perform an *exploratory laparotomy* in the frequently *uncertain clinical diagnosis and to make an early operation*. The diagnosis itself is difficult in



many cases because a relatively slow and *full pulse* is present which speaks against the assumption of an internal hemorrhage. As a rule, this is accompanied by a high frequent *pulse* so that except in the cases where the usual symptoms of *anemia*, the demonstrable movable dullness in the flanks, the circumscribed tension of the abdominal muscles, an *internal hemorrhage* would be presumed to exist, the diagnosis is rejected. Ten years ago in a large experimental and clinical article concerning liver injuries (Deutsche Zeitschr. f. Chir. 1912, Bd. 118), I was able to produce proof that the *bradycardia* is brought about by an absorption of bile acids *and represents a valuable symptom in injury to the liver*. On the basis of further observations in 9 cases I was able to explain in a new communication (Bruns Beiträge z. Chir. Bd. 119, S. 598) that by a careful observation of the cases *the bradycardia can be almost regularly proven*. For, in 13 cases of rupture of the liver which were not complicated by injury of any other organ and in 2 gun shot wounds in the liver, I was able to find slowing of the pulse 12 times, while in the remaining 3 cases it could not be proven any more on account of the late arrival at the hospital because tachycardia had set in. Since however this slowing of the pulse is also observed in *subcapsular* rupture of the liver this symptom is not yet *a reason for operative interference*. Only the clinical demonstration of free fluid which is really sometimes very hard to determine, together with the other symptoms of anemia determines operation.

Exactly in these doubtful cases it is much better



instead of waiting in uncertain diagnosis to make under local anæsthesia a small incision through which then, upon positive proof of blood in the free abdominal cavity, a large laparotomy incision can be made for the exploration of the abdomen in a short ether-rausch. The necessary amount of ether for this purpose is very small, at the utmost from 20 to 50 ccm., never exceeding 100 ccm. By an *early diagnosis* and the *exclusion* of general anæsthesia, particularly *chloroform*, the *prognosis* in these otherwise serious injuries can be decidedly *improved*. While I have in my 9 cases of subcutaneous rupture of the liver 6 recoveries and 3 deaths, where in the 4 cases operated on during the first 6 hours after injury, 3 recovered, *Boliarski* lost all 7 of his cases of subcutaneous rupture of the liver which were operated in *chloroform anæsthesia*, although they were all young men, and 5 cases came quite early and only 2 came too late for operation. It is self-evident that in a severe injury to the liver parenchyma even *the slightest amount of chloroform, which is known to be a severe poison to the liver, must not be used indifferently for the reason that chloroform under no circumstances whatever should be used at all*. To stop hemorrhage, especially in large lacerations of the convexity, tampon is still the best method since the tampon can be held firmly between the liver and the diaphragm. For lacerations on the liver border *suturing the liver*, on the contrary, is recommended, though the abdominal cavity in these cases should not be closed entirely on account of the danger of development of a secondary biliary peritonitis.



(e) *Operations for Cirrhosis of the Liver*

In connection with the operations of the bile ducts the operations for hepatic cirrhosis should be briefly mentioned. I have performed the *Talma* operation in 6 cases in such a manner that a large *preperitoneal pocket* is formed in which the inner surface of the *mechanically irritated* omentum is attached. All the cases were operated on in exact conductive anæsthesia of the abdominal walls without narcosis. All of these cases recovered. One case in private practice proved to be a *permanent ideal success*. While this 46 year old woman had to be punctured 18 times before the operation for ascites resulting from liver cirrhosis, after the operation which was performed June 5, 1916, in local anæsthesia, where the large omentum rich in blood vessels and well developed was placed in a preperitoneal pocket, she had still to be aspirated 12 times, but at longer intervals. For 5 years she has been absolutely well, the ascites has not recurred.

(7) SPLENECTOMY

Extirpation of the spleen has increased in frequency since the proposition was made that the removal of the spleen influences favorably *pernicious anemia*. Inasmuch as we have to deal with very weakened patients in this disease, in whom the number of erythrocytes has fallen below 1,000,000 and the hæmoglobin percentage to almost a tenth of the normal value, *chloroform* in any quantity above all things must be avoided in these cases. We must also be very



*cautious* with *novocain* because the usual amount and concentration may act fatally in these cases. For this reason splanchnic as well as paravertebral anæsthesia must be employed with great caution. Perhaps anterior splanchnic anæsthesia may be exceptionally employed with a  $\frac{1}{4}\%$  solution. If severe pulmonary disease does not contra-indicate every drop of ether, then I make use in these cases of local anæsthesia of the *abdominal walls* only and employ for the moment of the separation of the adhesions and the delivery of the spleen from the abdominal cavity a *brief ether-rausch*. In this manner it is easier, even in quite doubtful cases, to perform a successful operation. If for any reason the sustaining ether-rausch must be avoided in splenectomy for *tumor* then it is advisable to do the *paravertebral* conductive anæsthesia from the 8th dorsal to the 2nd lumbar nerves instead of splanchnic anæsthesia. Since by doing this the peritoneum of the diaphragm which according to *Braun* receives sensitive fibres from the intercostals is also interrupted; and this is important in the separation of the adhesions.

Personally I have performed 8 splenectomies for *pernicious anemia*. In 2 cases anæsthesia of the abdominal walls alone sufficed since we had to deal with a completely movable and not particularly enlarged spleen. In 3 cases 20 ccm. of ether were necessary to deliver the spleen and only in 2 cases, since severe adhesions were present, up to 50 ccm. of ether were given. One case, an old general afflicted with severe chronic purulent bronchitis, was operated on in *paravertebral* conductive anæsthesia.



Among these cases 3 died after the operation, among them the case operated on under paravertebral anæsthesia.

Since in the last case death occurred 24 hours after the operation the condition of the patient before the operation was so bad (erythrocytes 900,000; hæmoglobin 15%, somnolence) that an operation appeared perfectly hopeless from the very beginning, it would be unfair to attribute this death to the paravertebral anæsthesia. Operation in pernicious anemia is considered of doubtful value by many surgeons because of recurrence. Nevertheless we may, under circumstances, figure on *improvements lasting* for long periods. My first case which I operated on in the clinic *Hochenegg* in 1913, a woman, 42 years of age, who was in such terrible condition that during many weeks she was not able to stand up, so that I undertook the operation upon the urgent request of the internist, *was perfectly well 7 years after the operation*. On account of hæmolytic jaundice I have performed splenectomy twice under local anæsthesia and ether (recovery). Five times *splenomegaly* (*Banti's disease*) was the indication for the removal of the spleen. The size of the organ that reached far into the small pelvis caused the patient such severe suffering that he demanded immediate removal of the spleen. In one case there occurred in a *wandering spleen a torsion of the pedicle* with severe pains. The splenectomy in this case was relatively very simple. Of the splenectomies for tumor one case only was operated on in general anæsthesia (11 years ago in the clinic *Hoch-*



*enegg*); all the others were operated in local anæsthesia and ether; but only in one instance 80 ccm. of ether were used, otherwise only 10 to 30 ccm. were necessary. All cases recovered.

#### (8) OPERATIONS FOR INTESTINAL OBSTRUCTION AND PERITONITIS

The operation for bowel obstruction demands, like those for diffuse peritonitis, especial consideration because of the reduced *blood pressure* already caused by the disease which must not be depressed any lower, otherwise the danger of a fatal collapse on the operating table can hardly be avoided. In the general part of this book it is expressly stated why we must fear in these cases of general anæsthesia particularly chloroform at the moment of eventration. A brief ether-rausch during the moment of eventration will not harm, since danger of aspiration is not present, but since the blood pressure is not only not lowered but is increased, it will aid in preventing such a collapse.

For many years I have avoided general narcosis in ileus and performed the laparotomy in local anæsthesia, employing the short ether-rausch for the moment of eventration only. Although I have not refused operation in one case of peritonitis *or ileus*, and even when in consequence of severe vascular injury the extremities were cold and cyanosed, the radial pulse not palpable, I have had but *one death on the operating table* and that in a woman, 79 years of age, who came for operation *pulseless* 4 days after complete intestinal obstruction had set in. At the



operation a volvulus of the greater part of the small intestine with gangrene was found, so that this had to be removed and the ends sutured in the abdominal walls.

*The case of peritonitis* as a result of gastric perforation and appendicitis, like those cases of ileus in which an intestinal resection became necessary, are mentioned in the appropriate chapters. Besides these cases 34 additional cases of *intestinal obstruction* by strangulation, volvulus, pressure (mostly by malignant tumors, besides 2 cases of gall stone obstruction) and 4 cases of diffuse peritonitis where the origin could not be found even at post-mortem, further 4 cases of acute pancreatitis and 9 cases of peritonitis after subcutaneous rupture of the intestine were operated on.

Among the 34 cases of bowel obstruction 7 were operated on in general anæsthesia, 6 in lumbar anæsthesia; in 2 cases paravertebral conductive anæsthesia was used. Nineteen times local anæsthesia of the abdominal walls was employed which in 5 cases was amply sufficient, while 14 times ether had to be used periodically. *The success of the operation depends*, in the first place, upon the *duration* of the bowel obstruction, the peritonitis, or the kind of infection. The anæsthesia in these cases can possess only a *secondary importance*. Among 34 cases of intestinal obstruction 5 cases *died* in spite of the operation (2 cases of volvulus and gangrene of almost all of the small intestines; 2 cases of thrombosis of the portal vein; one case of combination obstruction by strangulation of the *small intestine* in a stenotic carcinoma



of the sigmoid flexure). In regard to the *technique* of local anæsthesia it must be once more pointed out that here the *conductive anæsthesia of the abdominal wall* by fan-shaped injection of the rectus muscles should *not* be applied on account of the danger that the inflated intestinal loops being pressed against the abdominal wall may be punctured, but *the incised surface should be infiltrated* in layers and *with great care* and only after the opening of the peritoneum to inject the peritoneum and rectus sheath with novocain.

*Among the 17 cases of diffuse peritonitis are 4 cases of acute pancreatitis and 4 cases of perforated peritonitis which died.* This absolutely bad result in the case of pancreatitis is explained by the high degree of the disease of the organ, in perforated peritonitis or metastatic peritonitis, since we are unable to exclude the source of infection, the prospects for a cure are almost negative. Of the 9 cases of *fæcal peritonitis* as a result of subcutaneous intestinal rupture 5 recovered, 4 died.

In the treatment of true diffuse peritonitis, especially following perforation of the gastro-intestinal tract, besides *the method of anæsthesia, the method of cleaning the abdominal cavity* is of great importance. Even if it is not yet definitely decided whether in diffuse peritonitis the abdominal cavity should be irrigated with normal salt solution or whether dry sponging should be employed, this much is certain, that by *irrigation with sufficient quantity* of normal salt solution up to 50 liters of body temperature, the abdominal cavity can best be freed in the most



*thorough and most conservative manner of purulent contents and foreign substances. I have become a convinced advocate of thorough abdominal irrigation with normal salt solution because of my own personal experience and thoroughly established my opinion 4 years ago in an article on diffuse peritonitis (Klin. therap. Wochschr. 1919, Nr. 21-24). While at the clinic v. Hacker in Graz, where in the performance of a laparotomy for diffuse peritonitis, either ether narcosis (never chloroform mixture) or the combination with local anæsthesia for the abdominal wall with subsequent ether-rausch, or lumbar anæsthesia are employed, besides irrigation of the abdominal cavity with normal salt solution, among 15 cases operated by me for diffuse peritonitis 8 recovered.*

And yet all cases, especially the cases of appendicitis, came very late for operation, mostly on the third or fourth day after peritonitis had begun. This may be explained by the fact that the local population is extraordinarily opposed to surgical operations, owing to nature cure teachings. While later, as assistant in the clinic Hochenegg 1900-1911, the cases operated on by me, according to the method prescribed in that surgical service (narcosis began with *Billroth mixture*, continued with ether) I had to employ cleansing of the abdomen with dry sponging, no irrigation, *all operated cases died. This actual experience has made me a convinced opponent of deep general narcosis, particularly with chloroform, and a firm advocate of copious irrigation with normal salt solution.* It must be particularly



emphasized, however, that irrigation with but a few liters of saline solution is positively insufficient, *that the irrigation must be continued until the solution reaches everywhere and comes away absolutely clear even from the subphrenic space*, otherwise after the clearing up of the general peritonitis, a subphrenic abscess may form, eventually causing death. The necessary quantity of solution for the irrigation varies from 20 to 50 liters.

Among the 9 cases of subcutaneous intestinal rupture with diffuse peritonitis 6 were irrigated, 3 of which recovered, including 2 cases which only came to operation after 20 to 24 hours with a severe peritonitis. In one of the 3 fatal cases the irrigation was *absolutely insufficient*, because only 8 liters of solution for the abdominal irrigation were ready so that toward the end the return from the subphrenic space was still cloudy. A man, 51 years of age, who came for operation 24 hours after injury to the Garrison Hospital No. 2 (which was not recognized by the inspecting physician) had a *total laceration of the ileum*, 50 cm. from the cecum. Very much faecal contents in the abdomen and a well advanced peritonitis. After the operation the peritonitis subsided with the spontaneous *passage of stool and gas*, but a large subphrenic abscess developed from which the patient died after 9 days. The 3 cases that *could be irrigated with normal salt solution* died from other reasons, in spite of dry sponging, even though they came to operation much earlier.



## (9) ATYPICAL ABDOMINAL OPERATIONS

Abdominal operations are here considered in which the findings at operation and the operative methods differ from one another. I will discuss relatively simple surgical procedures (e.g., the removal of a large sponge which had been left after a gynecological laparotomy and had produced bowel obstruction) which at times become very sensitive operations. I mention two of torsion of the omentum, one case of echinococcus of the posterior rectus sheath, two cases of pancreas cysts, two retroperitoneal cysts situated behind the cæcum, and finally a teratoma leading into the left hypochondrium. The last case is mentioned on account of its anatomical rarity as well as a proof of the efficiency of paravertebral anæsthesia.

A woman, 37 years old, operated on in Roumania, in 1911, for a tumor appearing below the left costal arch where the retro-peritoneal tumor was sutured into the abdominal wall and incised in two stages, followed by suppuration and fistula formation.

Second operation in June, 1912, at Vienna Sanatorium. Because the patient had repeated spells of dyspnoea the operator simply made an enlargement of the fistula. Suppuration increased continuously. The patient was sent for ambulatory treatment to the clinic *Hochenegg* by Doctor Radonicio, assistant in clinic *Ortner*. Dilatation of the fistula, excochleation in which much hair was removed. The fistula extended to the posterior abdominal wall. Later erysipelas developed. Suppuration became more



severe. Finally symptoms of amyloidosis when an attempt was made to do a radical operation which the poor general condition justified.

Operation November 30, 1912, paravertebral anæsthesia on the left side from the 7th to the 12th dorsal nerves. Very good. After cessation of the anæsthesia 100 ccm. ether. Duration of operation three and one-half hours. The tumor, the size of a child's head, was situated retroperitoneally between the stomach and spleen above the left kidney and fixed to the spinal column. We were able to separate it from the neighboring structures (stomach and spleen) and from the great vessels (aorta and cava); tampon of the large wound bed; recovery. The histological examination (Professor *Störck*) revealed a mixed tumor with remnants of ectoderm and mesoderm.

This case is a proof of the efficiency of paravertebral anæsthesia which was complete for more than two hours when ether became necessary to finish the operation. While the woman became repeatedly almost suffocated during the six months preceding the operation, the operator, a convinced opponent of conductive anæsthesia, was obliged to interrupt the operation. This time the woman went through the operation splendidly, although she had a long continued suppuration and erysipelas which lessened her vitality very much.



## (10) RESECTION OF SMALL INTESTINE

*The acute intestinal obstruction* resulting from strangulation, volvulus, etc., forms the most frequent cause for resection of the small bowel. In cases where a small bowel resection becomes necessary in a *strangulated hernia* the anæsthesia is relatively simple since, for the herniotomy, for which the exact conductive anæsthesia of the abdominal walls according to *Braun* suffices. For the bowel resection the simple *infiltration of the base of the mesentery to be resected is necessary*. In anæsthetizing the incarcerated hernia it is advisable to block the ileoinguinal and ileohypogastric nerves at the well-known 2 points, 2 cm. above and inward from the anterior superior spine, by injection into the internal oblique muscle and to inject the skin at the base of the hernia in the form of a rhombus. Over the *hernial swelling* itself one should infiltrate in *layers*, in order to avoid the possible puncture of the strangulated bowel loop. If, for opening the hernial sac and dividing the constricting ring, the intestinal loops are proven *gangrenous*, then inject *into the base of the mesentery* of the loops to be resected 20 to 30 ccm. of a 1½% solution of novocain. In this manner the division of the mesentery and the vessels that course through it is painless, so that we can perform with ease and exactness the bowel resection. In an incarceration of *long standing* it is important to *know that much more of the intestine has to be resected, than that which is incarcerated*.

At the afferent loops submucous and subserous



hemotomata may form at the time of eventration. They are superinduced by the long-continued overdistention and the *injury to the vessels* caused thereby even after the bowel has been partially emptied by puncture. In the region of these hæmotomata the resection of a gangrenous bowel must not be undertaken as there is danger of the intestinal suture not holding, or it may cause *perforation* or the formation of large ulcers that may lead to *perforation* and peritonitis.

Fourteen years ago, while assistant in the clinic *v. Hacker* in Graz, I operated on a woman, 45 years of age, who had suffered during the previous five days from an incarcerated inguinal hernia (Littre hernia) in lumbar anæsthesia whereby the gangrenous incarcerated hernia and 80 cm. of the afferent intestine were removed, because after eventration, new hæmatomata continued to form. After one week there occurred suddenly symptoms resembling tetanus and with these increase in temperature and pulse; death occurred. *The post-mortem* showed that there was a 2 cm. long and 1 cm. wide ulcer on the afferent loop of  $\frac{3}{4}$  cm. away from the point of resection which reached to the serosa, perforation of which was impeded by adhesions to the neighboring intestines, but which had formed the starting point of an acute sepsis (*S. Brauns. Beiträge d. Chir. 1910, Bd. 66, S. 216*). *There was therefore in this case  $\frac{3}{4}$  m. too little resection.* Through this case my attention was drawn to the necessity of an excessive resection in incarceration of long standing and I have since removed in small incarcerated hernias as much as  $1\frac{1}{2}$  to 2 m. of the afferent loop.



For anastomosis of the small intestine, I make the *side to side* anastomosis because the end to end suture with the unequal bowel lumen, as we usually find it in ileus, offers less security than does the broad lateral *anastomosis*. In order to avoid the formation of a large blind sac, it is necessary to place the anastomosis as close as possible to the blind closed ends, also to fix the blind closed stump of the afferent loop to the *broad* surface on the efferent loop, so that the stump does not become distended and form a cul de sac-like swelling (Fig. 42, C). On account of the nearness of the inverted bowel ends the *lateral* anastomosis must be made quite wide so that the opening through both the inverted bowel ends cannot be completely closed (8 to 10 cm.). An exact closure in the slit in the mesentery and an acute peritonealization are absolutely necessary for the prevention of strangulation and adhesions.

When the resection of the small intestine becomes necessary as a result of an *internal incarceration*, then after an accurate conductive anæsthesia of the abdominal walls for exploration and removal of the obstruction, a short ether-rausch is required. It possesses the advantage of combating the *collapse* during the eventration. But it is positively superfluous to continue the ether-rausch during the intestinal resection or to increase the same to complete ether narcosis, for it is amply sufficient if we inject 20 to 30 cm. of novocain into the base of the mesentery. For the abdominal suture also the abdominal wall anæsthesia is sufficient. Even should the use



of ether be employed the necessary amount, 30 to 50 ccm., is not exceeded.

Up to date I have performed *51 resections* of the small intestine. The 40 cases of simultaneous resection of the small intestine, in conjunction with the *radical operation for peptic ulcer of the jejunum*, are *not* included. Of these 51 resections 4 were operated on in general narcosis, one died from aspiration of the gastric contents, 2 cases were operated on in *lumbar anæsthesia*, one of which died after a week from sepsis originating in intestinal ulcers (previously mentioned case). One case operated on in *paravertebral conductive anæsthesia* (malignant degeneration, intestinal cystoma) recovered. In 44 cases conductive anæsthesia was employed, 30 of them alone, mostly in strangulated hernia, 11 times an ether-rausch was necessary in the search for the constriction. Among the 44 cases 8 died in spite of operation, equal to *18% mortality*. *Three of these cases could not have been saved under any circumstances.*

In one of them there had occurred in a 76-year-old woman a *volvulus of almost all of the small intestine* with complete *gangrene* so that a *resection of 4 m. of small intestine* was necessary. This operation was attempted in spite of the general bad condition of the patient because of the previous history of the case (stomach trouble for years) and the clinical findings, diffuse tenderness of the abdomen with considerable free movable fluid. A stomach perforation was the most likely to be



suspected by which a relatively simple closing of the ulcer could act as a life saver. Such a great undertaking as a resection of almost the entire small intestine for gangrene was absolutely out of the question on account of the bad general condition of the patient. The resection was done nevertheless because a gangrenous intestinal loop should never be returned to the abdomen. The replacing of the intestinal ends was impossible because of the close proximity to the plica duodeno-jejunalis.

In a second case 2½ m. of the jejunum were resected in a man, 62 years of age, on account of *thrombosis of the mesenteric vein*. The patient died after 24 hours. *The autopsy showed that a thrombosis of the vena cava* also existed, evidently present at the time of the operation, but could not be located where only gangrene of the bowel was found.

In a third case there existed for eight days a strangulation of a Littre's hernia in a woman, 41 years of age. The patient was noticeably very apathetic and lost before the operation. A gangrenous hernia had to be resected which was done without anæsthesia. At the autopsy *extensive hæmotomata* were found in *both adrenals* as evident cause of death (*Wr. med. W.* 1912 M. 34).

Three cases died of peritonitis, one of them had diffuse peritonitis which existed before the operation. In 2 cases gangrene of the bowel with *perforation* with *fæcal phlegmons* in the hernial sac existed due to the long incarceration. In these 2 cases the best



plan of procedure would have been to do a laparotomy away from the hernial ring, divide the afferent and efferent loops of the bowel, establish continuity of the intestine by *side to side anastomosis* and either make a blind closure of the intestinal coils and replace them in the abdomen, or still better to suture the *intestinal* ends in the abdominal wound for *total exclusion* according to *Hochenegg* and to incise the phlegmons of the sac at the conclusion of the operation. In this manner peritonitis might have best been avoided.

The results of my operations for resection of the small intestine are decidedly good, considering that among the resection cases there were *18 patients over 60 years of age*, more than one-third of the entire series. *Of 9 patients between 60 and 70 years of age 6 recovered, 3 died* (2 cases with phlegmon in the hernial sac and peritonitis, one case from sarcoma of the jejunum and peritonitis). *Nine cases were from 70 to 81 years of age, 6 of whom were over 75 years of age. Of these 9 cases only one died* and this was a 76 year old woman in whom on account of *volvulus and gangrene of almost all of the small intestine* resection had to be done. The remaining cases recovered. A new proof of the value of conductive anæsthesia is given in these operations by the fact that *not one single case died from pneumonia*. We are enabled under the protection of local anæsthesia, even in old age, to perform an extensive small intestine resection from relative indications, if only the difficulties of chronic ileus, caused by the numerous adhesions, can be relieved permanently, for instance,



after an operation for a large adherent umbilical hernia.

(11) ENTERO-ANASTOMOSIS AND COMPLETE  
INTESTINAL EXCLUSION

The incomplete intestinal exclusion by lateral *entero-anastomosis* can be done with comparative ease. All it actually requires is an *exact conductive anæsthesia of the abdominal walls* for the opening of the abdomen. At the utmost the exploration for the primary cause of the diseased focus may cause difficulty. The making of the anastomosis itself is entirely painless provided all traction upon the mesentery is avoided. It is therefore not absolutely necessary to inject novocain into the base of the mesentery, still it is to be recommended. For this reason I have but *rarely done* this operation because *the permanent results are quite unsatisfactory* as the bowel movement in lateral anastomosis is produced only when an accumulation takes place in the descending loop in front of the obstruction. By personal experience at the clinic *Hochenegg* and study of the literature I came to the conclusion for the correctness of the proposition made by *Hochenegg* 20 years ago, in all cases where resection is impossible *to make a complete bowel exclusion instead of a simple entero-anastomosis* in which the afferent and efferent loops are divided; the afferent ileum with efferent colon loop brought in end to end or side to side anastomosis and the peripheral end of the ileum, the same as the central end of the colon are sutured into the abdominal walls.



While for the simple entero-anastomosis, conductive anæsthesia is efficient in *total intestinal exclusion*, we must inject novocain into the *root of the mesentery of the ileum and the mesocolon* when dividing the mesenteries without causing pain. *Paravertebral anæsthesia* is not absolutely necessary for this operation, neither is the *splanchnic* which can be made from behind according to the *Kappis method*. Nevertheless I have made paravertebral anæsthesia 12 times, splanchnicus anæsthesia twice, but only because a resection of the colon had been planned but could not be done on account of the suppuration being present. Three cases were operated on in lumbar anæsthesia, in 5 cases the anæsthesia alone sufficed, while in 11 cases in exploring the abdomen and in confirming the diagnosis as to whether to resect or not a short ether-rausch was added. The first case operated by me was done in *Billroth mixture*.

In infections of the *small intestine* I nearly always have done resection. In 2 cases only was entero-anastomosis performed, but in one of these, i.e., luetic stricture of the intestine, 4 *entero-anastomoses* were necessary to exclude 20 stenoses. One resection of all of the small intestine was impossible, and so was a resection of every individual stricture with suture. In the second case we had to do with multiple tuberculous strictures of the small intestine.

I have performed *ileocolostomy* 8 times in the earlier years on account of tuberculosis, in recent time exclusively on account of *inoperable cancer*, in which disease, because of the short period of life,



the harmful consequences of a partial bowel exclusion cannot take place. Twice on account of stenosis of the colon, due to carcinoma of the gall bladder, ileocolostomy was done, 5 times *unilateral exclusion* of the cæcum with *ileocolostomy* was performed.

In 17 cases *complete intestinal exclusion* with sewing of both intestinal openings into the abdominal walls according to the suggestion of *Hochenegg* was done. Of all the operations the total exclusion is by far the greatest undertaking, but at the same time gives the best permanent results. If the operation is done under local anæsthesia the immediate results are good. Among my 17 cases of *complete intestinal exclusion* 2 deaths occurred, not immediately after the operation, but considerably later.

In one case there was an *inoperable cancer* of the cæcum in a very cachectic and *anemic* patient who died 5 days after operation, where at the autopsy, besides a large ulcerating cancer and severe anemia, nothing else could be found. In the second case there was besides stenosis of the cæcum a *carcinoma of the jejunum*, the size of a fist, which was situated  $1\frac{1}{2}$  m. away from the plica duodeno-jejunalis, which on account of the size of the lymphatics in the mesentery required an *extensive resection of the small intestine* (more than 1 m.). On account of the *stenosis of the cæcum* the *total exclusion* with ileocolostomy was done. This man, very cachectic before the operation, died 10 days later from *uncontrollable vomiting* for which the great shortening of bowel must be held responsible.



*What major operation can still be performed while patients are in general bad condition* is shown by the following case:

A woman, 31 years of age, had had 6 laparotomies preceding this one, where an anastomosis of the ileum and transverse colon and a second anastomosis of the ileum with the sigmoid flexure had already been made. In this very radical and difficult operation which was done principally in local anæsthesia and only for the separation of the numerous adhesions 125 ccm. of ether had to be used. *Both anastomoses were resected, the small bowel between had to be removed, then 2 new anastomoses* had to be made between the ileum and transverse colon on the one hand and both limbs of the sigmoid flexure on the other, and finally the whole cæcum was *completely excluded* according to *Hochenegg*. The patient withstood this radical interference in splendid form, rapidly recuperated so that the excluded cæcum could be extirpated in a second stage successfully.

*The great advantage of the complete exclusion* as compared with the entero-anastomosis is that with this operation the inflammatory adhesions and supuration are rapidly reduced, making a *secondary extirpation* of the excluded bowel possible without danger. I have performed this operation for secondary extirpation of the excluded intestines 6 times. An anæsthesia the same as for the resection of the



colon was required, namely the blocking of the lumbar nerves by *paravertebral anæsthesia*, besides the blocking of the tenth to the twelfth dorsal nerves.

Of the 6 extirpations 3 were operated on in *paravertebral anæsthesia*, which was quite sufficient; twice extirpation was done under *epidural anæsthesia* in which case also complete painlessness was obtained; one case was operated on in local anæsthesia of the abdominal walls and a subsequent brief ether narcosis; only the last case died, the rest recovered. This fatal case can assuredly not be attributed to the novocain used (90 ccm. of  $\frac{1}{2}\%$  solution). Since only 50 ccm. of pure ether were employed as an aid I blame the *accumulation of the alkaloids* which the patient had received, i.e., before the operation the usual 0.015 morphin and in the evening again for no reason whatsoever (only 0.02 pantapon supposedly), but by mistake very likely a larger dose of morphin was given. The fact remains that after 24 hours the woman was moribund, whereby in spite of the bad pulse, the deep cyanosis and almost complete failure of respiration *the pupils were contracted to the maximum as seen in morphin poisoning*.

Carcinomata also, which as a result of suppuration in the surrounding tissue cannot be radically operated at one sitting, can be operated on with success in two stages.

Four years ago in the Garrison Hospital No. 2, I operated on a man, 46 years of age, in paravertebral conductive anæsthesia for a large carcinoma of the hepatic flexure, which had per-



forated towards the liver. There also existed *a large abscess* between the liver and the carcinoma, I did the *total exclusion* of the ileocæcum to the middle of the transverse colon. Four weeks later, after the cessation of the suppuration I extirpated the excluded cæcum along with the carcinoma. Since *metastases* were found in the peritoneum of the posterior abdomen the wound bed was left open and directly X-rayed. *The patient up to this day (4 years) has remained perfectly well.*

#### (12) RESECTION OF THE LARGE INTESTINE

The nerve supply of the bowel comes principally from the *lumbar segment*. We must therefore in the first place in order to make division of the mesentery painless, block the rami communicantes derived from the *lumbar segment*. The resection of a long, *freely movable* segment flexure can be done painlessly under conductive anæsthesia of the abdominal walls and injected with novocain in the root of the mesosigmoid. But, where the separation of the broadly attached ascending or descending colon comes into question, this anæsthesia may be insufficient, at least for the separation of the large bowel from the abdominal wall *a brief ether-rausch becomes necessary* which, as far as the prognosis is concerned, is of slight importance. The resection and suture of the mesocolon can be done without continuing the ether-rausch, *provided novocain is injected into the root of the mesocolon*. Only in rare cases with absolutely



freely movable ascending colon with a common mesentery abdominal anæsthesia may be sufficient for the entire operation in conjunction with the injecting into the mesentery.

*Among the 34 resections of the cæcum and ascending colon* with subsequent ileocolostomy 6 were done under local anæsthesia of the abdominal walls and infiltration of the mesentery alone. Nineteen times ether was employed in conjunction with the local anæsthesia, yet, in most cases only very small quantities up to 50 ccm. were necessary. Nine cases were operated on in paravertebral anæsthesia where the injections were made *on one side only*, i.e., into the tenth dorsal to the fourth lumbar nerves. Only in the last cases instead of injecting into the vicinity of the tenth to the twelfth right dorsal nerves, I did *splanchnic anæsthesia* of the right side instead, using thereby 30 ccm. of a 1½% solution.

In unilateral paravertebral anæsthesia I was able to establish in 2 cases, where an absolute painlessness during the operation was obtained, that at the moment when we came towards the left *over the middle line* with the resection the patients would immediately indicate, that they felt pain. It is also important in unilateral paravertebral anæsthesia to inject novocain into the *mesentery* of the lowest coils of the ileum and that of the mesocolon ascendens before division is made, because we know that the innervation of the large bowel belongs partially to the region of the splanchnics and that besides on account of the anastomosis with the left side in the coeliac ganglion only with bilateral anæsthesia of the splanchnic nerves



or their roots the anæsthesia of the large bowel must be complete under all circumstances. Of the 9 cases of paravertebral anæsthesia the anæsthesia was incomplete, only in 2 cases necessitating the additional use of ether.

Of the 55 *resections of the descending colon and the sigmoid flexure*, 2 cases were operated on in general anæsthesia (both 12 years ago); in 16 cases paravertebral anæsthesia was employed, but it was incomplete in only one case so that a small amount of ether had also to be used. Here, instead of doing the paravertebral injection into the dorsal segment, splanchnic anæsthesia on the left side was made. In 37 cases local anæsthesia of the abdominal walls with infiltration of the mesenteries was used, 12 times exclusively, 25 times with the addition of from 20 to 100 ccm. of ether. Out of 55 resections 39 cases were operated on in one stage where at once the colon suture side to side was done. Sixteen cases were operated on in 2 *stages*, since owing to the presence of obstruction the primary suture appeared insecure. Both the intestinal ends were sutured into the abdominal walls making an artificial anus.

*The immediate results of the operation* are also very good in suturing of the large bowel. Among 34 cases of *cæcum resection* with ileocolostomy 3 cases died at the conclusion of the operation = 8.8% mortality.

A 69 year old woman died on the seventh day after a resection of a carcinoma of the cæcum from *pulmonary embolism* originating from a thrombosis of varicose veins.



A 10 year old boy died 24 hours after a resection of the cæcum, ascending colon and transverse colon for megalocolon with subsequent ileocolostomy and a 2 stage resection of the sigmoid flexure through a second laparotomy wound. The operation was begun in local anæsthesia with a  $1\frac{1}{4}\%$  novocain solution 80 ccm. and then continued under ether. Whether the *acute edema* which occurred in the right and the sudden heart weakness are to be traced to the ether or to *both* together cannot be positively determined. I am convinced that in this case I went too far as to the *indications* and that this case might have been saved if I had done the operation in 2 stages, i.e., first resection of the sigmoid flexure with primary suture or placing the bowel ends and then later resection of the cæcum and colon ascendens. Perhaps also for the complete exclusion of the large intestine through an artificial anus at the cæcum sufficed in order to gradually bring about a shrinking of the excluded colon.

The third case cannot be explained because autopsy could not be made. A 53 year old woman was operated on for *bowel obstruction* with fæcal vomiting and after a long exploration a *small stenotic* carcinoma of the transverse colon near the splenic flexure was found (numerous tears in the serosa). The already distended cæcum, ascending colon and transverse colon with the carcinoma were resected and an ileocolostomy with the descending colon side to



side was made. On the day following stool occurred after bowel irrigation and from the third day on *bowel passage*. From the fourth day on severe diarrhoea containing blood, up to 20 stools a day. Abdomen soft, temperature somewhat elevated. On the seventh day *sudden collapse and death* under the *symptoms of pulmonary embolism*. There were no *diagnostic symptoms of peritonitis*.

*The results are still better in resection of the descending colon and sigmoid flexure with primary suture of both ends of the colon. For I show among my 39 resections with primary suture only 2 fatal cases=5.2% mortality.*

One fatality occurred in the Garrison Hospital No. 2, after resection of a carcinoma of the sigmoid flexure. The peritonitis which was found at autopsy is to be traced back in this manner to the unsterilized salt solution which was used for the conductive anæsthesia. The anastomosis suture was nevertheless sufficient in spite of the peritonitis (water test).

It was one of the first operations which I performed in 1915 in the new surgical clinic. I found out after a week that the sterile physiological salt solution, which was ordered from the apothecary, was unsterilized and made with ordinary water.

The technique is blamed for the second death. For in this case, a woman, 62 years of age, 2 months previously on account of *volvulus* of the flexure and co-existing *biliary peritonitis* resec-



tion was done in 2 stages. Upon the urgent request of the patient the artificial anus again having closed after 2 months resection of the entire anus and *circular suture of the flexure* was made. In the narrow intestinal lumen, especially in the efferent loop, a stenosis developed at the point of the suture under slight tension, leaked and led to peritonitis.

*This is the only case of suture dehiscence* among all of the intestinal resections which I had performed. Whether the second operation was performed too early after the subsidence of the peritonitis, which also played a rôle in the giving way of the suture, is perhaps possible, but cannot be proven. It would certainly have been reasonable in this case to operate 6 months or a year later, or at least to have made *a broad lateral anastomosis* after mobilizing the descending colon.

The *superiority of local anæsthesia* over general narcosis is again illustrated in the following instances.

Seven and a half years ago I operated on a General, 64 years of age, for a carcinoma of the sigmoid flexure about the size of 2 fists. He had been operated on the year before for intestinal obstruction by my predecessor in the Garrison Hospital No. 2, where a completely fixed carcinoma of the descending colon was found. The abdominal wound was closed on the left side and an artificial anus made in the cæcum. Because the patient was much molested by this artificial



anus (almost always liquid stool) and the formation of a large hernia, which involved the wall of the cæcum and bled profusely, he demanded its removal. This could be made possible only after the performance of an entero-anastomosis between the colon and the sigmoid flexure. Although the tumor had grown to *three times the original size* according to the statement of the first operator and the patient had become much reduced in general health during the past year, I was able one year after the first operation to *resect the large tumor with simultaneous removal of the fascia and part of the iliac muscle under paravertebral conductive anæsthesia*. After separating the left ureter from the tumor I mobilized and resected the tumor along with 50 cm. of large intestine and anastomosed the transverse colon side to side with the lower part of the sigmoid flexure. The patient, much weakened by the long suffering, withstood this severe extensive operation splendidly. After 6 weeks the cæcal fistula on the right side was closed. Since then the man has gained back his normal body weight and is today,  $7\frac{1}{2}$  years after the operation, perfectly well.

In the *Billroth mixture* anæsthesia I would not have been able to do a radical operation on this patient successfully, but would have had to be satisfied with the first consideration of an entero-anastomosis between the transverse colon and the sigmoid flexure for the exclusion of the tumor.



In a second case a *hypernephroma*, the size of a man's head, that had already grown into the descending colon was extirpated from a 52 year old man. The descending colon was resected in its entirety and an anastomosis of the transverse colon with the sigmoid flexure was made side to side. In this case also

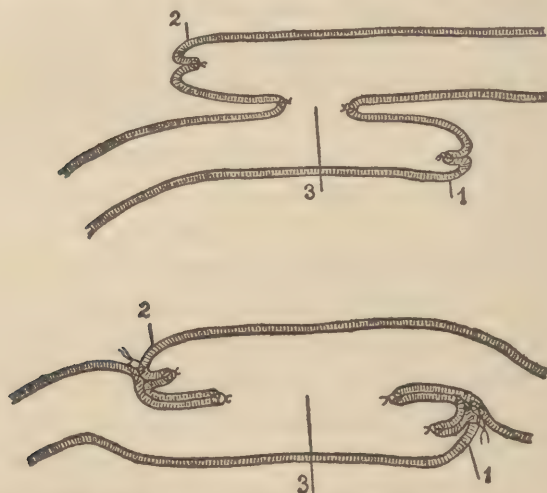


FIG. 42.—Side to side anastomosis in colon resection. 1, afferent loop, the end closed by purse string suture; 2, efferent loop; 3, anastomosis. The lower figure shows the good functioning anastomosis.

the much weakened patient withstood this extensive operation very well without the slightest signs of shock.

The suturing of the *large intestine* was formerly considered particularly *dangerous*, yet apparently without justification. Of course with this suture it is especially important to be convinced before the operation *whether or not the intestinal wall*, at the point of resection, has sufficient *blood supply*. In order to



convince myself I apply no clamps in separating the mesosigmoid from the intestinal wall, but *sever the vessels* and permit them to bleed. If they do not pulsate properly the separation of the mesentery from the intestine must be continued until the small vessels *spurt distinctly*. Only then are we assured that the intestinal wall is properly nourished. *A very exact 3 layer intestinal suture* is just as important whereby in the application of the Lembert suture great care is needed so that the mucous membrane is not penetrated, which naturally would lead to the oozing of fæcal matter. Whether to apply the anastomosis end to end or side to side should depend, in the first place, upon *the diameter of the lumen of the large intestine*.

In radical operations for *carcinoma*, because of the uneven intestinal openings, I prefer the *lateral anastomosis*. At the same time it is very important that the anastomosis is not made too narrow, that it is made near the blind closed end, that also both the blind closed intestinal ends are fixed by means of sutures to the intestinal wall, laterally, as is shown in the lower part of Fig. 42. This prevents the blind closed intestinal ends, particularly in the afferent loop, to fill with stool and dilate into large diverticula and finally lead to the symptoms of bowel obstruction. The inversion of the closed end into the anastomosis and its temporary closure can thus be prevented.

Only for resection for *megasigmoid* I make end to end anastomosis because stenosis is excluded by the wide lumina. *The suture in all cases must be*



so placed that it will hold absolutely, so that stool can pass over the suture immediately. *Reichel* asserted many years ago that in suturing the large bowel the *rapidity* made necessary by the use of general anæsthesia is the cause of the suture not being exactly placed, as it necessarily should be if it is to hold. In local anæsthesia rapidity in operating is generally not necessary, therefore the results here are much better and actually at that time *Reichel* was able to point to 14 cases of primary operation for cancer with only one fatal result for which the operation could not be held responsible because a *recurrence* followed after 3 months.

In local anæsthesia the severe forms of *intestinal atony* are practically speaking always *absent*. This atony with the overdistended fresh suture is one of the greatest dangers for the security of the intestinal suture, and the absence of it is one of the principal causes for the good results obtained in resection of the large bowel in local anæsthesia. For comparison only a few examples from modern literature are mentioned.

*Jelaffke* (*Tietze*) reported among 13 one stage colon resections, four deaths or 33% mortality, and 22 two stage operations with 36% mortality. Among these the cases of acute obstruction are excluded from the resection.

In the Breslau clinic in the last fifteen years, according to a communication from *Cläßen*, only 50% of the cases were radically operated on, in which the advancement was mostly made. Among 38 operated on in two stages with advancement nine died, or



23.7% mortality. Of 28 operated on in one stage, i.e., those cases treated by primary suture, among which were 20 ileocolostomies, ten died, or 36% mortality.

In the clinic in Bonn (*Gärre*) according to a report from *Majerus*, in sixteen resections of the cæcum in one stage two cases died, or 12.5%; of thirteen resections of the descending colon and the sigmoid flexure four cases died, or 30%. The cases of ileus were not operated on radically but treated with colostomy alone. Among my material the mortality, considering only the resections for carcinoma in the one stage colon resection is 13% (22 carcinoma resections with three deaths, twice from pulmonary embolism, once from peritonitis). In the two stage resection 11%. Nine advancements with one fatality. At the same time it is to be considered that in the stage of complete bowel obstruction resection was done, that among 31 radical operations six patients over 70 years, one woman 86 years old, stood the operation well and recovered.

### (13) RADICAL OPERATION FOR CARCINOMA OF THE RECTUM

Since in the radical operation for carcinoma of the rectum, particularly in resection, the peritoneum must be opened extensively, these operations belong in a certain sense to the abdominal operations, even if it has to be admitted that the further course of the operation depends upon the possible development of *wound infection*. Up to 1915 I operated on carcinoma of the rectum almost exclusively under *nar-*



*cosis*, only in 6 cases the operation was performed under lumbar anæsthesia. Since that time I have used exclusively the *parasacral* (actually *præsacral*) conductive anæsthesia. Only 2 cases were operated on in epidural anæsthesia.

From the investigations of *Fröhlich* and *Meyer* concerning the *nerve supply* of the lower large bowel we know today that the rectum is supplied with sensation by the *sacral plexus*, that the higher sections (100 cm. above the anus) derive feeling from the higher segments and the *lumbar segment* and the area of the *splanchnicus*. If we perform the parasacral anæsthesia only, as *Braun* describes it, we are able to operate on the deep seated rectal mucosa painlessly, but, if we are compelled to remove a large part of the sigmoid flexure with the carcinoma situated high up, then the mobilization of the flexure is painful. If a very long mesocolon is present, novocain may be injected at the root of the mesosigmoid through the incision during the preparation. But with a very short mesosigmoid and more difficult mobilization even this act will always be painful.

In order to exclude this pain I inject *novocain* into the anterior surface of the fifth to sixth lumbar vertebra before the operation through which the novocain reaches the base of the mesosigmoid and blocks the sensitive fibres running to the mesosigmoid by diffusion. In this manner carcinoma high up in the rectum and carcinoma of the pelvic colon can be operated on painlessly. *Braun* has according to a report by *Staffel* in 56 operations for cancer of the rectum operated on in parasacral anæsthesia only 2



failures and 3 incomplete anæsthesias requiring a temporary narcosis. In the other cases the operation could be performed without further general narcosis. Even when the separation of the rectum extended up to the flexure and this had to be brought down the patients hardly ever complained of pain. These clinical results apparently contradict the findings made by *Fröhlich* and *Meyer*. If we consider that among the 56 cases there were 52 *amputations* of the rectum with sacral anus where not even the entire rectum was extirpated and that only 4 of the resections were done with primary suture, it becomes apparent that also *without anæsthesia of the nerve endings of the splanchnicus the pains could be avoided*. Of course this presupposes that the mesosigmoid is very long whereby all traction upon it becomes unnecessary.

Since more than 4 years ago I combine the parasacral anæsthesia with exclusion of the end fibres communicating with the splanchnicus fibres by injecting novocain into the anterior surface of the fifth dorsal vertebra which by diffusion affects the retroperitoneal space at the root of the mesosigmoid. This also enables us to exert strong traction upon the mesosigmoid without causing pain. When we still operated on *high rectal carcinomata* by the sacral route at the clinic *Hochenegg* there often occurred the necessity to remove 30 cm. or more of the sigmoid flexure. In these cases, during the first few years, the separating of the mesosigmoid was only possible after renewed injection of novocain into it. This was easy enough if the flexure, after tying off the hemorrhoidal artery, fell forward in toto, otherwise ether



had to be used temporarily. My material embraces 75 radical operations for carcinoma of the rectum which were performed by the *sacral* route. In 25 cases the extirpation of the anus was done and a sacral anus made. In 50 cases *resection* of the rectum and a part of the flexure was carried out and almost always the *circular suture* in the wound was made. Only exceptionally, where the carcinoma invaded the ampulla, the mucous membrane of the anal ring was also removed and the mobilized flexure drawn through the sphincter, according to the method of *Hochenegg*.

In the early days up to 1915 all operations were done almost exclusively under general narcosis, only in 6 cases lumbar anæsthesia was employed. Since then the operations have been done in parasacral anæsthesia. Thirty-three cases were done in general anæsthesia; 6 cases in lumbar anæsthesia; 2 cases in epidural anæsthesia; in 234 cases parasacral anæsthesia was used. In 6 cases ether became necessary as a help; in 4 cases the patients suffered pain during the mobilization of the flexure. In these cases parasacral anæsthesia only without previous injection in front of the fifth lumbar vertebra was made. In one of the 5 cases the *anæsthesia* was perfect for 2½ hours so that the *resection of the rectum* with a large portion of the flexure as well as extirpation of the *uterus and the adnexa*, which was necessary on account of the invasion of cancer, could be performed entirely without pain and only for suture of the pouch of Douglas ether had to be employed, sensation having returned. Only in one case the parasacral anæsthesia was a *complete failure*, but this is



made perfectly clear by anatomical conditions. It concerned a 60 year old woman with a carcinoma completely *fixed to the sacrum* on whom the radical operation was attempted. Because of the fixation of the carcinoma to the sacrum, direct injection was impossible. A diffusion of the solution being out of the question, ether had to be employed (340 ccm.). At the operation the carcinoma together *with the periosteum* of the sacrum was separated from the bone with a raspatory which caused a very considerable hemorrhage as may be easily understood. The patient died after 48 hours from pulmonary edema as a result of heart failure. At the post-mortem *metastases were found in the liver*. Whether the cardiac insufficiency which had caused the pulmonary edema is to be traced to the ether or to the hemorrhage cannot be decided. The small amount of novocain that could be injected in this case has no significance whatever.

In carcinoma of the rectum the influence of local anæsthesia upon the operative results is not as noticeable as in resections of the stomach or bowel, since here the peritoneal opening is small and the wound does not affect the respiration and expectoration, but the cure is dependant upon the course of wound healing whether an infection occurs or not. Of the 75 operations 9 cases died=12% mortality. Five of the cases died in the first 8 days, one of which was a case of strangulation of a *loop of small intestine* which had been pressed through the opening in the pouch of Douglas by repeated vomiting. Two cases died from *sepsis*, one of which was an 81 year old man in whom



extirpation of the rectum with sacral anus was performed for cancer of the ampulla in which as a result of poor nourishment of the loops *gangrene* and, with it, infection of the wound occurred.

A 56 year old woman died on the fifth day from *double pneumonia*. This woman was operated on January 14, 1918 in parasacral anæsthesia in a sanatorium. With a cold operating room (only 12° C.) the occurrence of pneumonia can be easily explained. The diagnosis of double pneumonia was made by Professor *Singer* who was the attending physician. It is important that in this case parasacral anæsthesia only was used. The fifth fatal case has been previously discussed in detail.

*Four cases died* after the *first week*; one case after 3 weeks from *brain metastases* (confirmed by autopsy); one case on the sixteenth day from a *post-operative hemorrhage* from a ligated hemorrhoidal artery which was embedded in the cancerous tissue. The last 2 cases must be entirely excluded from the mortality since the operation, the anæsthesia, or a wound infection, cannot be blamed. Actually *inoperable* cases are concerned here, wherefore the mortality due to operation is less than 10 %. The results are nevertheless favorable if we consider that among 75 radical operations *29 cases were over 60 years old*; 5 cases really were over 70 years. It is plain that this operation yields good results with ether narcosis, especially if sufficient morphin and atropin are injected before the narcosis. Chloroform and mixtures of it must be avoided under all circumstances in old people on account of the injurious influence upon



the heart. But it is also certain that in local anæsthesia even with *the worst general condition* the operation can be attempted, even if the operation has been rightly declined under general anæsthesia.

Four years ago I operated on a 65 year old man with a stenotic cancer 10 cm. above the anus who had been declared inoperable to his relatives by a prominent surgeon because of his general bad condition (severe emphysema, myocarditis) and suspected liver metastases. The patient eventually had to be operated on for an acute intestinal *obstruction*. Before the operation I could not agree with the view as to the inoperability for the removal of the cancer because the enormous enlargement of the liver without protuberances could only be taken for a hypertrophic *cirrhosis of the liver* (patient was a distiller). At the laparotomy performed because of *bowel obstruction* this assumption was confirmed. At first *colostomy* at the transverse colon. Before proceeding with the proposition of radical operation the patient was examined by Hofrath *Hochenegg* who declared for anatomical reasons the radical operation possible, but on account of the bad general condition (enormous hypertrophy, severe myocardial degeneration with arrhythmia and edema of the feet, considerable asthma with chronic suppurative bronchitis) I considered the operation hopeless. Since I was able to perform the operation (resection of the carcinoma with circular suture) perfectly in parasacral conductive anæsthesia the further course was uneventful. Patient recovered and is perfectly well up to date, 4½ years after the operation. The enlargement of the liver has to a certain extent become reduced.



Anæsthesia for the radical operation of rectal carcinoma is so simple that it could be done by all surgeons. It would be a great gain if at least parasacral anæsthesia were made as *Braun* has recommended it. It affords no difficulties if we avoid the injection on the anterior surface of the fifth lumbar vertebra. Thereby the greater part of the narcosis is saved, which in itself is a great gain.

#### (14) ABDOMINO-SACRAL OPERATIONS

High up rectal carcinoma can be operated on by the sacral way only if the flexure possesses a long mesosigmoid, therefore can be drawn down easily, if besides adhesions of it with the surroundings, especially with the anterior abdominal wall, are absent. If this is not the case then either the radical operation for carcinoma has to be given up entirely or we are forced to interrupt the sacral operation, perform a laparotomy and break up the adhesions, whereby the carcinoma eventually becomes operable. With laparotomy one is enabled to follow the lymphatics *high up in the mesosigmoid* and to remove them, which in the sacral operation can only be done as high as the promontory. Without doubt laparotomy offers greater possibilities for a truly radical operation than the sacral operation alone.

*Against* the abdomino-sacral operation the objection was raised by competent authorities, above all by *Hochenegg (Mandel)* the *high primary mortality* as compared with the simple sacral operation. Should we succeed in reducing the mortality considerably then this operative method will find certain justifica-



tion in the future. The abdomino-sacral extirpation is, as a rule, performed mostly under *general anaesthesia*, laparotomy requiring *deep anaesthesia* for which large amounts of ether are necessary, *fatal cases immediately* following the operation are therefore *no rare occurrences*. If we succeed in excluding these deaths even partially we will be more justified in resorting to this operation. Personally, when a former pupil of *Hochenegg*, I favored the sacral operation and only in exceptional cases when the tumor was located high, but slightly movable, the *combined* operation was taken into consideration. If we are compelled during the course of a sacral operation to interrupt it and perform a laparotomy, it becomes necessary to change the position of the patient twice because I never fail to observe the continence and always draw out of the sacral wound the mobilized flexure for the circular suture. The double changing of position during the operation means a lengthening of the time for the operation and a certain danger of asepsis.

Amongst my material there were 23 abdomino-sacral operations, 19 times for high rectal carcinoma (15 to 20 cm. above the anus), 4 times for benign diseases and twice for extensive polypi of the flexure where the histological examination of the piece excised for examination pointed to carcinoma. In the fourth case there was an extensive stenosis of the flexure after dysentery which required the extirpation of the whole of the diseased flexure and the descending colon and the anastomosis of the transverse colon to the lowest part of the rectum through the sacral wound.



Three times the operation was *begun* with the exposure of the sacrum and *parasacral* anæsthesia done in the usual manner. Since resection was impossible on account of the high location of the carcinoma the laparotomy was performed in conductive anæsthesia of the abdominal walls, a *brief ether narcosis* was employed for the mobilization of the flexure. In the remaining cases the laparotomy was started *at once* because a radical operation by the sacral route alone did not seem at the beginning possible because of the high location of the cancer and because of the immobility of the tumor (over 15 cm. measured by rectoscopic examination). In 3 of these cases the carcinoma was situated more than 20 cm. above the anus, this meant a carcinoma of the pelvic colon. In these cases laparotomy was begun under conductive anæsthesia of the abdominal wall for mobilizing the flexure, a short ether-rausch was added, but the laparotomy suture was made without narcosis. In the same way the sacral operation was performed in parasacral conductive anæsthesia. In this way it was possible in spite of the long duration of the operation to get along with an insignificant amount of ether (50—150 ccm.). Only in one single case on account of the absolute fixation of the carcinoma parasacral anæsthesia was not any more possible for the sacral operation, ether was necessary (300 ccm. ether). In one case operation was done in epidural conductive anæsthesia and was combined with the parasacral anæsthesia. Twice the whole operation could be done without ether (in a 75 year old man and in a 68 year old man). Twice during the mobilization of the flex-



ure 40 ccm. ether were necessary. In a further case, a 70 year old man, the operation could be performed entirely in conductive anæsthesia although no paravertebral anæsthesia was made, but novocain was injected into the mesosigmoid and into the sacral cavity through the open abdomen by which the whole operation could be performed without the assistance of ether.

The immediate results of this operation are not ideal as yet, nevertheless considerably better than the results previously obtained. Of 23 cases 6 died as a result of the operation, equal to 26% mortality. Only one case died directly after operation.

An officer, 51 years old, who was operated on during the war in the Garrison Hospital in whom ten months previously a colostomy had been made in the clinic *Eiselsberg* for an inoperable cancer of the rectum. The patient had considerable pains as a result of pressure of the tumor upon the sacral nerves which could not be relieved by large doses of morphin (0.4 to 0.5 subcutaneously). The patient demanded urgently an operation or else he would be forced to commit suicide. In this case conductive anæsthesia of the abdominal walls was done for the laparotomy, while for the sacral operation ether narcosis was necessary. Parasacral anæsthesia being technically impossible (300 ccm. was necessary). Only with the greatest patience could the tumor be mobilized firmly fixed to the ileum. Completion of the laparotomy and sacral ex-



posure of the rectum. With painstaking care and under strong traction the large tumor was finally brought forward and delivered through the sacral wound. Tampon of Douglas. Skin suture. Death after a few hours.

The operation in this case was a palliative one, only attempted because of the urgent request of the patient who declared that if he was not relieved of his terrible suffering he would commit suicide. Such deaths are never avoidable especially if the outlook before operation is so bad. We are justified in deducting such cases in reckoning the mortality of operations.

A 65 year old man died of a *diffuse peritonitis* which could not be traced to wound infection from the rectum, but to an operation infection. This fatal case is the more deplorable because there was only a quite small beginning carcinoma that could be located by the proctoscope 20 cm. above the rectum by Doz. *Zweig* and pathologically proven to be carcinoma (Prof. *Stærk*). This early diagnosis by *Zweig* made the prospects for a permanent cure quite favorable. An operation by the sacral route alone which had at first been considered on account of the age of the patient would have been impossible to perform on account of the high situation of the tumor and the shortness of the mesosigmoid; the attempt at operation would have brought with it the great danger that the tumor might have been overlooked on account of its smallness, though it had been positively demonstrated.



The remaining 4 deaths were traced to wound infection with subsequent sepsis, that is peritonitis and retroperitoneal suppuration. Three of these cases have in common that because of invasion of the peritoneum of Douglas by the carcinoma so much of the peritoneum had to be removed that after the drawing through of the mobilized flexure, *suture of Douglas became impossible* and it had to be tamponed. On one occasion circular intestinal suture was made, twice the stumps were brought forward in the sacral wound after the removal of the tumor.

If we are forced during the course of a sacral operation to interrupt the operation and to perform a laparotomy we must change the patient twice, since *I never renounce the continence and always deliver the mobilized flexure for the application of the suture.* One case died of sepsis following wound infection.

In this 75 year old man a circular, almost immovable carcinoma, situated 18cm. above the anus, was relatively easy to remove. The suture of Douglas, the same as the intestinal suture in the wound could be accomplished without the least tension. In this case it was possible to complete the entire operation in paravertebral and parasacral anæsthesia so that the patient showed a perfectly ideal course for the next 3 days. On the third day a bowel movement occurred. In spite of the opium, which came at first through the anus but tore the suture, the enormously large stools came through the sacral wound leading to infection and sepsis from which the 75



year old patient died. Had a lateral colostomy at the transverse colon been done so as to give the patient free bowel movement, this patient would also have withstood this great operation.

As these high seated carcinomata belong rather to the sigmoid flexure and are mostly circular with strong tendency to stenosis, the bowel movements are usually deficient. If in such cases a colostomy at the transverse colon is first made whereby we can explore the condition of the liver as regards metastases, not only will the operation be made much easier, but also the circular intestinal suture in the sacral wound will not be endangered. *It is therefore recommended that in all such cases where on account of the high seat of the carcinoma the combination operation becomes necessary, to have the operation preceded by a preparatory colostomy. In this manner we will be enabled best to reduce the number of wound infections.*

Laparotomy itself I used to perform by a left-sided pararectal incision. I soon convinced myself that through median laparotomy between the symphysis and the umbilicus the mobilization of the flexure, the tying off of the mesosigmoid and the ligating of the hemorrhoidal artery, are much easier performed than in lateral laparotomy.

In this certainly severe major operation, after a long series of observations, the extremely favorable influence of conductive anæsthesia will be noticeable. Even if it does not always succeed in replacing general anæsthesia entirely, it will be possible in ac-



curately performed conductive anæsthesia *to reduce the amount of ether necessary* to a very great extent so that the amount of ether otherwise required for narcosis will be insignificant. *We can also perform this major operation with success in existing arteriosclerosis, in old age, etc.* At the clinic *Hochenegg* according to recent reports by *Mandel* of 17 abdomino-sacral operations 9 died=2.9% mortality. Not all cases were operated on. Old people, in whom a sacral operation alone could have been performed without trouble, were denied operation, also those cases with advanced cachexia. Actually in these cases we find 3 between 60-62 years of age.

*Payr* according to a report from *Pribram*, in the years 1910-1921, operated on 31 cases by the abdomino-sacral route and experienced 19 fatalities as a result of the operation=61% mortality. Among them 11 cases who could not recover from the great amount of surgical interference, died in the next few days after the operation from heart failure.

I have thus far operated on all cases in which the sacral operation was not possible any more on account of the high situation of the trouble, regardless of age, general condition, etc. (See case No. 1, page 317). I have among the 19 abdomino-sacral operations for carcinoma 8 cases that were over 60 years of age, the oldest among them was 75 years. In spite of the old age of the greater part of my cases the total mortality is 31.6% adding even the first cited death that had been declared inoperable by competent surgeons ten months previously where only a palliative operation was done. As most of these major



operations were performed in the clinic *Hochenegg*, whose great services in the development of the operations for rectal carcinoma are well recognized, according to my opinion only the circumstance that at that institution *all cases are operated in deep general narcosis*, where besides ether various mixtures of chloroform are used, while among my material, *the narcosis for support only* and in very small quantities was used, explains the difference in the results obtained. *This again would be a proof that the exclusion of deep general anæsthesia contributes toward the improvement of the results of operation.*

The value of the abdomino-sacral extirpation is best illustrated by the following interesting case:

A 58 year old cachectic man was operated on in Lemberg in January, 1920, for intestinal obstruction. The tumor, slightly movable, situated 18 cm. high, was considered inoperable and a right-sided cæcostomy made. At the end of October, 1920, the patient came to Vienna because the cæcostomy had almost entirely closed, so that only after dilatation, stool was passed. Proctoscopic examination showed a stenosis 18 cm. above the anus, but the carcinoma could not be brought in view.

Operation November, 1920, in Franz Josef Ambulatorium. At first laparotomy in conductive anæsthesia, later ether anæsthesia (for the whole course of the operation, 200 ccm. ether), carcinoma about the size of a fist, a hand-breadth above the cul de



sac, fixed to the promontory, well united with the peritoneum of the posterior abdominal wall on the left and adherent to the iliac artery. After patient mobilization the iliac artery was separated. The glands in the mesosigmoid reached high up in the peritoneum, therefore the entire flexure had to be removed. The descending colon and splenic flexure were mobilized and the transverse colon brought down. Abdominal suture, then *Kraske* mobilization of the rectum, delivery of the flexure, resection of 50 cm. large intestine, circular suture, drainage. On account of the large amount of stool; the circular suture did not hold. Three weeks after, colostomy at the transverse colon, 3 weeks later, plastic operation for the rectal fistula; after healing of this, closure of the colostomy wound. Discharged cured. Later gained 20 kg. August, 1922, examination, no recurrence, looks good, there was left however a small sacral fistula with occasional pus formation in that region.

In this case also it would have been better and in the interest of the intestinal suture to perform at first a colostomy in the transverse colon on account of the poor functionating cæcostomy that was present. Because this case not only withstood the operation, but after 2 years is still free from relapse is proof that in apparently hopeless cases the radical operation is still worth the risk.

It is to be hoped that by further development of conductive anæsthesia as well as the technique of the operation, it will become possible to lessen the mortality to such a degree that in deep seated rectal carcinoma also this will find more frequent applica-



tion than has been found up to this time. Then surely we will be in a position, by exact enucleation of the lymphatics up over the promontory, to improve the permanent results of the high situated rectal carcinomata.

#### (15) OPERATIONS ON THE FEMALE GENITALS

Concerning conductive anæsthesia in operations on the female genitals but little personal experience is at my disposal, since these special operations, in clinics as well as in private practice, are performed with preference by *gynecologists*. In exceptional cases only, particularly if the diagnosis has not been properly made or when besides the genital disease a surgical disease exists, the general surgeon comes into position. The rare cases where uterine myomata or intraligamentous ovarian cysts which develop between the layers of the mesosigmoid and give rise to intestinal obstruction, come also to the general surgeon. In these I, during the last ten years, employed conductive anæsthesia of the abdominal walls exclusively for laparotomy. This was followed by an ether-rausch for the delivery of large tumors, novocain injected from within on both sides of the pelvis in the parametrium, in the suspensory ligament of the ovary which makes further narcosis superfluous. In 6 ovarian cysts, 3 of which were operated on because of twisting of the pedicle, besides the conductive anæsthesia, 10 to 50 ccm. ether were necessary.

After several gynecologists had refused a 56 year old woman in whom on account of severe



decompensated heart lesion operation was urgently demanded to relieve her suffering, I had finally in spite of an unfavorable prognosis to risk the operation. Owing to compression of the flexure by the ovarian cyst symptoms of chronic bowel obstruction also occurred. This intraligamentous ovarian cyst had grown between the layers of the mesosigmoid in such a way that the flexure was stretched to a thin string over the convexity of the cyst. By conductive anæsthesia of the abdominal walls and with 30 ccm. of ether I removed the cyst, which was the size of a man's head. The subsequent infiltration of the base of the mesosigmoid and the parametrium were also attended to. The woman withstood the operation splendidly in spite of the decompensated heart lesion and now, after 5 years is free from abdominal trouble.

*Extirpation of a myomatous uterus* can be done under conductive anæsthesia when necessary. For this purpose an exact conductive anæsthesia of the abdominal walls and also anæsthesia of the parametrium are necessary. This can be accomplished by advancing parasacral anæsthesia or by injecting, after opening the abdomen and after delivery of the uterus, a novocain solution into the parametrium and the suspensory ligament of the ovary. Novocain should at the same time block the hypogastric plexus situated in front of the 5th lumbar vertebra. In such cases where no complete anæsthesia is obtained by the novocain injection small quantities of ether



may be used which do not affect the organism. I was obliged in one case to perform a total extirpation of a myomatous uterus in order to be able to do a unilateral exclusion.

A 57 years old, very thin woman, with an incarcerated hernia and suppurating hernial sac on the right side, of six days' standing. I resected the gangrenous loop and advanced the bowel ends in local anæsthesia. As the woman became much emaciated by this intestinal fistula it became necessary in a secondary operation to resect or at least to totally exclude the artificial anus. The woman had a myomatous uterus which reached to the ensiform cartilage and which occupied the whole abdomen and was forced down into the pelvis and compressed the sigmoid flexure. I had to extirpate the uterus before I was able to do the bowel exclusion. This made sufficient room and relieved the compression of the flexure. Median laparotomy was performed in conductive anæsthesia for the delivery of the incarcerated uterus from the pelvis (10 ccm. of ether were necessary). Otherwise the whole operation was performed in conductive anæsthesia (total extirpation of the uterus with conservation of the ovary, unilateral exclusion of the artificial anus with side to side anastomoses between the ilium and transverse colon). For this purpose novocain solution was injected into the parametrium and into the mesentery of the ilium. Although the patient



was much reduced by the long existing incarceration and also by inanition due to an intestinal fistula, she withstood this major operation very well and complained on the same evening of the operation why they would not give her something to eat.

In gynecological laparotomies the relative frequency of gastro-intestinal atony is observed, which may possibly be a consequence of the deep general narcosis with chloroform or a mixture with it. If ether is used these complications are less often observed, but they occur, since a very large quantity of ether is necessary for the narcosis. If we use conductive anæsthesia of the abdominal walls and of the parametria, combined with a brief ether-rausch, then we can lessen considerably the dangers of the operation and improve the results of the operation. For vaginal operations, according to *Braun*, parasacral anæsthesia suffices. It possesses the advantage over lumbar anæsthesia in that it is less dangerous and has a more lasting effect. It is according to *Braun* the anæsthetic of choice. Since I do not perform vaginal operations, which are done exclusively by the gynecologist, I have no personal experience. *Thaler*, of the *Schaute* clinic, interested himself very much about the introduction of local anæsthesia in vaginal operations. After he had employed conductive anæsthesia for the cleaning out of the uterus by the way of anterior colpohysterotomy, he undertook to perform major vaginal operations and eventually applied the process also in



extensive total extirpation of the cancerous uterus through the vagina with success by the *Schauta* method. The following anæsthesia was performed:

First, anæsthesia of the vulva by injecting 10 ccm. of  $\frac{1}{2}\%$  novocain solution subcutaneously into the perineum, into the labia majora and into the left paravaginal region. Ten cubic centimeters were injected into the labia majora, into the rectovaginal septum (6 cm. deep) and then into the ischiorectal fatty tissue. Circular anæsthesia of the uterus and its surroundings by placing two lateral deposits of 10 ccm. each at the lateral insertion of the vaginal vault, 5 cm. deep with the needle pointing laterally toward the pelvic wall. Ten cubic centimeters each between the uterus and bladder and towards Douglas pouch to a depth of 5 cm. Submucous infiltration of the anterior vaginal wall with 5 ccm. Beginning of the operation after a 12 minutes' wait. *Thaler* had performed up to 1920, 203 vaginal abdominal operations in para-uterine infiltration anæsthesia, among which were 81 total extirpations of the carcinomatous uterus according to *Schauta*. Fifty cases were done without ether.

#### (16) KIDNEY OPERATIONS

Kidney operations actually do not belong to the category of abdominal operations because in the lumbar operation the peritoneum is not opened. Only the cases operated on transperitoneally should be considered here. Still, I mention kidney operations because by their perfect simplicity they afford a good field for novocain conductive anæsthesia. For



nephrectomy lumbar anæsthesia, as well as paravertebral conductive anæsthesia and splanchnic anæsthesia at our disposal. Paravertebral anæsthesia was first employed and recommended by *Lärwen* in kidney operations, later used by *Kappis* in a greater series of cases. The latter recommends an injection from the 8th dorsal to the 1st lumbar nerves. Personally I have performed nephrectomy in my position as chief of the Garrison Hospital No. 2 and in private practice 10 times in all and most always employed the paravertebral anæsthesia. In 7 cases anæsthesia alone was sufficient. In all cases after isolation of the kidney before the clamping of the kidney pedicle I have had to reinject novocain into the kidney pedicle and into the surrounding peritoneum.

While previously the patients evinced sensations of pain during the attempt to grasp the kidney pedicle, by this method the pedicle can be ligated without pain. This additional injection into the pedicle of the kidney is to be recommended, especially on account of existing nerve anastomoses with the opposite side, unless we make a short ether-rausch for this part of the operation. When the pedicle is short and the tumor large, the least traction causes pain; then ether should be given. I have needed ether only 3 times, in one case especially where on account of the invasion of a large hypernephroma, the size of a man's head, into the descending colon, the peritoneum opened widely and an extensive resection of the large intestine with the making of an anastomosis between the transverse colon and the sigmoid



flexure, had to be performed. The amount of ether used during the operation was insignificant. This patient, in spite of the great surgical interference, made a most ideal post-operative recovery.

Before the beginning of the war, I operated on another case of hypernephroma, originating in the adrenal substance, extirpated the large tumor without the kidney which was situated underneath, but perfectly separated and therefore remained. The patient died about an hour after the extirpation. Since in this case only the 8th dorsal to the 2nd lumbar nerve on the left side were blocked, using 40 ccm. of  $\frac{1}{2}\%$  novocain solution and besides 40 ccm. of  $\frac{1}{2}\%$  solution for the abdominal wall anæsthesia, the amount of novocain really was too small, but it is hardly possible to speak of a direct injury having been caused by its use. The man had 3 months before the first operation (extirpation of the spleen), a severe attack of cardiac insufficiency that could be combated only with great difficulty. Nevertheless this case constitutes such little proof of the dangers of paravertebral anæsthesia, that I do not hesitate to use this form of anæsthesia in kidney operations. But it is necessary to use great caution when making the injection, in order not to make a lateral lumbar anæsthesia with large doses of novocain unknowingly by inaccurate introduction of the needle which naturally might act fatally. *Kappis* had one death as a result of the paravertebral injection among 32 kidney operations performed in paravertebral conductive anæsthesia. In a few cases he had to use some ether for the tying off of the kidney



pedicle where novocain could be demonstrated in the spinal fluid.

By its simplicity paravertebral anæsthesia in kidney operations is practically harmless when an accurate technique is used. If in spite of this we fear it we can get along with infiltration anæsthesia somewhat farther away from the ganglia and secondary infiltration of the peritoneum at the kidney pedicle, and in some cases without ether. If in serious cases of large tumors ether is given temporarily, these small amounts do not affect the organism, or the remaining kidney. We may well agree with *Braun* when he describes this combination as a great gain over the operations in general anæsthesia.







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\* Abbreviations: Med. Klin. = Medizinische Klinik. — Wr. klin. W. = Wiener klin. Wochenschrift. — Wr. med. W. = Wiener med. Wochenschrift. — Arch. f. klin. Chir. = Archiv. f. klin. Chirurgie. — D. Z. f. Chir. = Deutsche Zeitschrift f. Chirurgie. — Btg. z. klin. Chir. = Beiträge zur klin. Chirurgie. — Gzgb. d. M. u. Chir. = Mitteilungen aus dem Grenzgebiete der Medizin u. Chirurgie. — Zbl. f. Chir. = Zentralbl. f. Chir. — Vh. d. D. G. f. Chir. = Verhandlungen d. Deutschen Gesellschaft f. Chirurgie.



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